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IMPACTS ON SOCIOECONOMIC CONDITIONS

ISSUES

Changes in river use management regulations for the Colorado River in Grand Canyon National Park could affect the regional and local economy in several ways, including changes in commercial operators' revenue and operating profit and Bar 10 Ranch and Hualapai tribal revenues. These changes could also have impacts on the regional economy and use and trespass implications for portions of the Havasupai and Navajo Reservations.

GUIDING REGULATIONS AND POLICIES

The National Environmental Policy Act requires analysis of social and economic impacts resulting from proposed major federal actions in an environmental impact statement. From this requirement, the National Park Service has identified conditions that it wants to achieve in association with its management of national parks. These conditions are described in the NPS *Management Policies 2001* (NPS 2000d) and for Grand Canyon National Park. They include the following:

Public participation in planning and decision-making ensures that the National Park Service fully understands and considers the public's interest in Grand Canyon National Park, which is part of their national heritage, cultural traditions, and community surroundings. The Service actively seeks out and consults with existing and potential visitors, neighbors, people with traditional cultural ties to the Grand Canyon, scientists and scholars, concessioners, cooperating associations, gateway communities, other partners, and government agencies.

The Service works cooperatively with others to improve the condition of Grand Canyon National Park; to enhance public service; and to integrate the national park into sustainable ecological, cultural, and socioeconomic systems.

In the spirit of partnership, the service seeks opportunities for cooperative management agreements with state or local agencies that would allow for more effective and efficient management of Grand Canyon National Park.

Possible conflicts between alternatives and land use plans, policies, or controls for the area concerned (including those of local and state governments and Indian tribes) and the extent to which the national park would reconcile the conflict are identified in environmental documents.

MANAGEMENT OBJECTIVES FOR SOCIOECONOMIC CONDITIONS

The management objective for socioeconomic conditions as it relates to management of recreational river use in Grand Canyon is to provide a diverse range of recreational opportunities while minimizing the impacts of actions to resources, user groups, and park neighbors.

METHODOLOGY FOR ANALYZING SOCIOECONOMIC EFFECTS

The sources of the data used in the analysis are as follows. For the Lees Ferry alternatives, the model for projecting commercial operators' revenues and gross operating profits is based on individual companies' financial data provided to the National Park Service on Schedule H at the end of their fiscal year (typically, Dec. 31, 2003). Data on trip prices was compiled by the park's Concessions Management division. For the Lower Gorge alternatives, the National Park Service relied on financial data provided by the Hualapai Tribe, Bar 10 Ranch for their operations in 2003, and internal own records for reliable data on the number of takeouts at Diamond Creek.

Analysis of the economic impacts has been performed to evaluate potential effects of the Lees Ferry alternatives on commercial operators, a guest ranch associated with Whitmore helicopter operations, Native American communities, and the regional economy. For the Lower Gorge alternatives, potential effects of the alternatives were evaluated for Hualapai tribal revenue sources.

Environmental consequences of implementing the alternatives were evaluated for each of the subject areas identified above. Assessments of potential economic impacts were based on comparisons between Alternative A (the no-action alternative) and each of the action alternatives. The significance of these impacts was evaluated in relation to the affected environment described in Chapter 3.

The economic impacts to commercial rafting operators have been determined by representing the expected average impact to the operators as a group. The actual specific future impacts to individual operators would depend on their specific circumstances.

The spending impacts of rafters on regional output and employment associated with the Lees Ferry alternatives were estimated using the input-output IMPLAN (Impact Planning) model. The model provides both background economic information and estimates of the cumulative economic effects that result directly and indirectly from an initial spending change.

For the Lower Gorge alternatives, revenue estimates are projected at maximum capacity and are given as net revenue. This revenue is projected at the maximum permitted daily rate of use times the number of days in the season or year times the net revenue per person for the Hualapai Tribe after commissions and discounts. Impacts to Las Vegas air tour operators were not included in the analysis as they occur outside the analysis area.

IMPACT THRESHOLDS

The general process for assessing impacts to the environment is discussed in the "Introduction" to Chapter 4. Effects specific to socioeconomic resources are characterized for each alternative based on the impact thresholds presented below. Additionally, each alternative is evaluated to determine whether effects are direct or indirect.

Intensity

Negligible — Impacts would be at the lowest levels of detection and would have no noticeable adverse or beneficial effect. If quantified, they would represent a change of less than 2%.

Minor — Adverse: Impacts would be detectable but would not have any overall adverse effects.

Beneficial: Impacts would be detectable but would not have any overall beneficial effects. If quantified, minor effects would represent a change of between 2% and 10%.

Moderate — Adverse: Impacts would be clearly apparent and adverse.

Beneficial: Impacts would be clearly apparent and beneficial. If quantified, moderate effects would represent a change of between 10% and 20%.

Major — Adverse: Impacts would have substantial adverse effects and could be expected to alter those environments on a long-term basis.

Beneficial: Impacts would have substantial beneficial effects and could be expected to alter those environments on a long-term basis. If quantified, major effects would represent a change of more than 20%.

Context

Localized — Impacts would affect few businesses or localities.

Regional — Impacts would be widespread across the region.

Duration

Short term — Impacts would last three to five years or less.

Long term — Impacts would last longer than five years to the life of the plan.

Timing

Impacts from changes in river use are generally seasonal. Lees Ferry seasons are winter (November to February), shoulder seasons (March and April, September and October), and summer (May to August). Lower Gorge seasons are the peak (May to September) and non-peak (October to April).

MITIGATION OF IMPACTS

Commercial rafting operators from Lees Ferry to Diamond Creek operate under concessions contracts with the National Park Service which statutorily require that the operator have a “reasonable opportunity for net profit in relation to capital invested and the obligations of the contract.” Thus, changes in operators’ revenues and expenses may be mitigated in the concessions contracting process, whereby maximum price rates are set by the National Park Service, and franchise fees are set according to an in-depth modeling of the required investments and operating costs of the business opportunity.

Large, one-time costs to operators (e.g., purchases of non-motor equipment that may be required by an alternative) may be mitigated by extending a phase-in process for the requisite equipment and by considering the depreciated value of the current equipment. Assuming that commercial operators would continue to operate viably, negative impacts, if any, caused by one-time costs are likely to be amortized and therefore negligible for the business community working with this tourism segment.

Similarly, adverse impacts to Hualapai tribal revenue resulting from reductions in use at Whitmore Exchange need not be mitigated as they are all minor or negligible in their own right and overshadowed by the beneficial impacts of Lower Gorge projections.

CUMULATIVE IMPACTS

Cumulative socioeconomic impacts were determined by combining the impacts of each alternative with other past, present, and reasonably foreseeable future actions, regardless of what agency or organization undertakes the action. (See the “Introduction” to Chapter 4 for a detailed list of all actions).

Glen Canyon Dam has influenced the socioeconomic environment for river runners since its construction in 1961. While recreational river-running saw a steady increase in popularity in the late 1960s and early 1970s, the predictability of flow levels that resulted from operations of the dam contributed to the increase in demand for Grand Canyon river trips by increasing the stability of commercial operations. Consequently, commercial operators were able to better market trips and capitalize on a lowered level of operational uncertainty. Lower flows sometimes result in increased expenditures by concessioners, given the increase in accident-related costs, missed exchanges, and the need for additional equipment, but commercial operators have been able to adjust by modifying operations according to predicted flows. Overall, ongoing operations of Glen Canyon Dam have had a direct, regional, beneficial, long-term, year-round, and moderate to major effect on commercial operations.

The establishment and implementation of management prescriptions for recreational use on the river by Grand Canyon National Park contribute to visitor safety and satisfaction, as well as the protection of the biophysical environment. While these requirements result in capital outlays by commercial operators, they ultimately contribute to the sustainability of river-running operations into the future. Additionally, “Commercial Operating Requirements” add to the value of trips by contributing to the safety and aesthetics of the river environment and to the integrity of its resources. This results in a direct benefit to commercial operators and passengers, as well as noncommercial passengers. It has an indirect benefit on local communities that depend on revenue from commercial operators and businesses that supply all river trips. Overall, “Commercial Operating Requirements” have had a direct and indirect, localized to regional, beneficial, long-term, year-round, and minor to major effect on the socioeconomic environment.

The Hualapai Tribe has indicated that they may increase fees for Whitmore operations and Diamond Creek takeouts. This increase would result in a negligible to minor benefit to tribal income from river-related operations, and in a negligible effect to commercial operators, provided that fees were not raised enough to prohibit marketing of these services. Impacts to

river runners (commercial and noncommercial) would be adverse and negligible to minor, depending on the type of trip and the amount of increase. Overall, these operations contribute to the infrastructure of the river-running environment, so unless fees were raised to a prohibitive level, the increase would not diminish the value of the service. Overall, an increase in Hualapai fees would result in both beneficial and adverse, short- to long-term, localized, minor effects that would be most noticeable in the summer season.

Drought conditions could affect the socioeconomic environment for recreational use of the Colorado River in the Grand Canyon. If conditions resulted in unforeseen adverse effects to resources or river users, changes to river management would be made through an adaptive management process (see Chapter 1).

The combined effects from the operations of Glen Canyon Dam, the implementation of operating requirements, and accessibility and cost of services at Diamond Creek and Whitmore create a favorable socioeconomic environment for commercial operators, their passengers, and localized communities that depend on river-related revenue. To some extent, noncommercial passengers also derive benefit from these effects. Overall these direct and indirect effects are beneficial, localized and regional, short to long term, and minor to major; they are most noticeable in the high-use summer season.

ASSUMPTIONS

General

General assumptions used for analysis of effects from each alternative are discussed in the “Introduction” to Chapter 4. Additional assumptions that specifically relate to the *Colorado River Management Plan* alternatives and their socioeconomic effect are presented below.

- The analysis area is the affected populations and area of analysis (or region) as described in Chapter 3.
- Commercial and noncommercial boating in Grand Canyon are separate markets. That is, changes in the supply or demand in one market would not affect the other.
- Demand for river trips, both commercial and noncommercial, would continue to exceed supply. Therefore, there is sufficient unmet demand for additional trip offerings, whether motor or non-motor, to match an increase in supply.
- As price levels are determined by the National Park Service, rather than by market equilibrium, these prices are not expected to change as a result of the change in supply.
- Land management agencies and tribes would seek to offset costs through additional user fees. These fees are not anticipated to decrease the demand for commercial or noncommercial river trips beyond supply.
- Socioeconomic effects from trespass onto adjacent Hualapai, Havasupai and Navajo lands are likely to continue, regardless of the alternative. Mitigation of these impacts may be achieved through improved educational efforts with boaters, operators, and guides (implemented by Grand Canyon National Park), and through enhanced permitting by the tribes. This issue is discussed further in the “Adjacent Lands” section of Chapter 4.

- The Grand Canyon air tour industry generates substantial revenues in the Grand Canyon region (over \$100 million). Nevertheless, only the air tours that shuttle passengers to and from river trips at Whitmore and Quartermaster are subject to economic effects from river-related recreation. Look-and-leave tours in the Quartermaster area land only on Hualapai tribal land and are operated under the jurisdiction of the tribe. The economic effects of these flights will be addressed as part of the Grand Canyon West operations in the cumulative effects subsection of each Lower Gorge alternative.
- Increases in impacts on natural quiet (i.e., the natural soundscape) in one part of the park must be coupled with a decrease in another part of the park to achieve the substantial restoration goal, per Public Law 100-91. For this reason, increases in river-related flights could affect allowable flights, and thus the opportunity for profit, for air tour operators elsewhere in the park. However, such assessments and management actions are outside the scope and independent of this plan, so they are not further evaluated under cumulative effects of the alternatives.

Assumptions for the Lees Ferry Alternatives

Regional Impact Analysis. The analysis of regional impacts is based on an analysis of IMPLAN data by Hjerpe and Kim (2003), updated with 2003 river usage data. It uses type SAM multipliers* for total output, employment and labor income for the computation of the total effects (direct, indirect and induced effects) of regional expenditures by both commercial and noncommercial boaters. Because the structure of these economic activities does not fundamentally change among the alternatives, it is assumed that the multipliers remain constant. Since not all of the commercial river runners are based in the region, the total regional economic effects are likely to be slightly overstated.

Noncommercial Boating. The number of days allocated to noncommercial trips increases by more than 28% in each of the alternatives considered. Therefore, the socioeconomic effect on the private boating community, including its associated commercial enterprises, is likely to be beneficial, long term, and major for all alternatives in comparison to Alternative A (current conditions).

Commercial Boating. The potential for socioeconomic impacts in the commercial boating community is more complex. Therefore, greater emphasis has been required to assess the effect of the alternatives on commercial rafting operators, Bar 10 Ranch, the Hualapai Tribe, and the regional economy.

Three alternatives (C, D and F) include new commercial use during the winter season (November through February) and, for these alternatives, this new use represents 85-96% of the additional user-days allocated. Although demand for commercial trips during this season is unknown, it is assumed that it would be greater than the supply in all three of the alternatives.

* Social Accounting Matrix (SAM) multipliers include the effect of social security transfers, taxes and savings, as well as commuter income spent outside the region.

Commercial operators would seek to operate efficiently, given the constraints dictated by the alternatives, i.e., they would reconfigure their trips to maximize revenue and meet operating requirements while minimizing operating costs.

Current concession operations are viable under current operating and market conditions. The price of commercial river trips would remain approximately at current levels. Some slight price increases may occur in order to mitigate changes in operating costs and to preserve appropriate opportunity to make a profit. Such changes are not anticipated to decrease the demand for commercial river trips beyond supply.

The average trip lengths for both motor and non-motor trips remain similar to what they are today, regardless of the number of motor and non-motor trips offered. Changes to this assumption for alternatives with reduced or no motor use (Alternatives B, C and D) are considered in the impact analysis introduction under the section Major Revenue and Cost Drivers.

Currently, seasonal fluctuations in commercial operations create inefficiencies in staffing, equipment requirements, and other overhead costs; therefore, a less seasonal operation offers operational advantages.

As stated under the Mitigation of Effects section above, there are opportunities to mitigate socioeconomic impacts by adjusting franchise fees and prices. Furthermore, operators are expected to continue to have considerable flexibility and opportunity to reconfigure and adapt their future operations and staffing to maintain their profitability. Given the current demand for rafting employment and the contract hiring of many rafting guides, this assumption seems reasonable.

Assumptions for the Lower Gorge Alternatives

Two additional assumptions are fundamental to the Lower Gorge analysis:

- The rates for the projected services of the Grand Canyon Resort Corporation of the Hualapai Tribe are computed at best NPS estimates of current (2003) net prices, after commissions and discounts.
- The Grand Canyon Resort Corporation would seek to maximize its revenue by operating these services at their maximum permitted levels. Projected net revenue is calculated at the daily maximum permitted use levels over the duration of the entire season or year. These projected figures must be interpreted with care as estimating the potential for significant long-term growth in such an industry is highly imprecise.

IMPACT ANALYSIS — LEES FERRY ALTERNATIVES

ANALYSIS COMMON TO ALL ALTERNATIVES

Interrelationship of Key Variables

User-days, number of passengers, group size, launches, motor vs. non-motor, guide-to-client ratio, and trip length are the most important variables in analyzing the economic impacts of the plan alternatives. These variables have a complex inter-relationship in determining resource impacts, revenue, and expenses; change to any one of these variables typically results in changes to the other variables. The alternatives provide different arrangements of these variables. Analysis of these variables is complicated by the number and variation of commercial trips offered and the variation in the types of equipment used. Of these variables, user-days is the most important as it is the most fundamental use constraint for operators. Several examples of the inter-relatedness of these variables follow:

User-Days — If other variables (e.g., trip length, group size, and number of launches) remain constant, decreases in user-days would reduce revenue and profitability.

Trip Length and Number of Passengers — If the number of user-days remains constant, reducing the number of unique passengers by increasing trip length would have a minor impact upon operator revenues. However, such a drop in revenue would be offset by operational cost savings due to decreased labor required to find, serve, and manage customers, and to perform launches.

Number of Launches — If the number of user-days remains constant, decreasing the number of launches implies an increase in trip length, unless an off-setting number of exchanges occur. Launches increase operational costs.

Group Size, Guide-to-Client Ratio — There are economies of scale in rafting operations, whereby operational costs can be decreased by increasing group size. Larger trips generally have a lower guide-to-client ratio, thereby increasing profitability by reducing labor costs. Mandated changes in group size may result in a change in optimal equipment, including van and boat size. Such changes would be short term in duration, and negligible.

For river use permitting purposes, a passenger is defined as one person for the entire trip through the Upper Gorge. As some trips include passenger exchanges at Phantom Ranch and Whitmore, the number of commercial passengers may be less than the number of individuals on commercial river trips.

Major Revenue and Cost Drivers

An analysis of the likely effect of each of the alternatives on commercial river runners' revenue shows that changes in user-days are a reasonable proxy for changes in revenue. While the other key variables (number of passengers, number of launches, group size and trip length) have an effect, it is minimal compared to that of user-days. Under each of the alternatives, the changes in expected revenue on a per user-day basis are less than 5% compared to the current situation.

Similarly, the analysis shows that river operation costs are highly variable in nature, and are driven by the number of user-days. This is logical, since fewer user-days require less food, staff time, and other variable costs to be expended. Therefore, user-days can be used as a proxy for gross operating profit (revenue minus direct labor costs). The effect of the other variables, given the current pricing structure, is minor. Under each of the alternatives, the changes in expected gross operating profit on a per user-day basis are less than 5% compared to the current situation.

Research and extensive public comment suggest that trip length is a determining factor in choosing a river trip. Given that average trip length for motor trips is currently between 7 and 8 days, if motors were to be eliminated, the demand for shorter non-motor trips would be expected to increase (the average non-motor trip length is currently between 13 and 14 days), as would the number of transfers at Phantom Ranch (and Whitmore). A limiting factor in these transfers is the willingness (and ability) of visitors to hike down into the canyon or up to the rim from the river. Even if one assumes that every motor trip that is eliminated under Alternative B, C and D becomes a non-motor trip of the same length, our model suggests that the change in commercial river runners' gross operating profit would, in the aggregate, still remain highly correlated to the change in user-days. Therefore, user-days remain a good proxy for gross operating profit.

Mitigation of Effects through Franchise Fees

Concession franchise fees are determined during the contracting process between commercial operators and the National Park Service. They are related to the probable value of the business opportunity to the concessioner, and they must allow a reasonable opportunity for the concessioner to realize a profit, based on the required investments and operating costs of the business opportunity. Concession franchise fees are determined during the contracting process, and they may be higher or lower than a previous contract, based on financial analysis of the current business opportunity. In the case of commercial river-running operations, the adverse economic impacts of some alternatives could be mitigated by charging lower concessions fees, if the analysis determined this was necessary to maintain a reasonable opportunity for profit. Similarly, alternatives with beneficial impacts would allow for higher franchise fees. Thus, a change in operating requirements that would have a significant economic impact would likely result in an offsetting adjustment in the franchise fee.

Franchise fee-based mitigation does not apply to indirect service providers (such as Bar 10 Ranch and Grand Canyon Resort Corporation of the Hualapai Tribe) that do not operate under NPS concession contracts.

ALTERNATIVE A (CURRENT CONDITIONS)

Analysis

Alternative A describes the existing operations and current conditions. Under this alternative, no new operating restrictions or requirements are proposed associated with the *Colorado River Management Plan* that would affect current river use. That is, user-days would remain capped at current levels, which would result in approximately the same number of total yearly passengers.

Under Alternative A, the No-Action alternative, impacts to commercial river runners' revenue and gross operating profit, and Bar 10 Ranch and Hualapai tribal revenues would be negligible, localized and long term, with a seasonal emphasis on the higher use summer months of May through August. As the alternative reflects a continuation of current conditions, there would be no impact (beneficial or adverse) to any of the operations mentioned above.

The Hualapai Tribe has proposed a new helicopter fee that would increase fees by \$10 per person for approximately 10,300 exchanges per year at Whitmore, but this increase is not part of the NPS alternatives for river rafting and thus is not an impact of this plan.

An analysis by Hjerpe and Kim (2003), based on IMPLAN economic data and updated using 2003 river usage data, estimates that commercial and noncommercial river rafting in the Upper Gorge together generate \$34.6 million in regional expenditures and create 582 jobs (this includes direct, indirect and induced effects using type SAM multipliers). Therefore, river rafting currently makes up less than 1 percent of the regional economy in terms of both output and employment. Changes in river rafting users' projected visitor spending may affect the output of both the region's tourist related sectors (such as retail and lodging businesses) and the regional economy as a whole. Changes in visitor spending may also result in job gains or losses for the regional economy.

Because Alternative A does not change current conditions, socioeconomic impacts from river runner use and spending to tribal lands and the regional economy under this alternative would be negligible, localized and long-term, with a seasonal emphasis on the higher use summer months of May through August.

Mitigation of Effects

Effects from Alternative A are negligible, so they would not require mitigation.

Cumulative Effects

Specific effects from past, present, and reasonably foreseeable actions are discussed earlier in this chapter. The combined effects from the operation of Glen Canyon Dam, the implementation of "Commercial Operating Requirements," and accessibility and cost of services at Diamond Creek and Whitmore create a favorable socioeconomic environment for commercial operators, their passengers, and localized communities that depend on river-related revenue. To some extent, noncommercial passengers also derive benefit from these effects, as well. Overall these direct and indirect effects are localized and regional, beneficial, short to long term, and minor to major; they are most noticeable in the high use summer season.

Cumulatively, the effects of Alternative A, when combined with other past, present, and reasonably foreseeable actions, would be localized and regional, beneficial, short to long term, and minor to major, which would be most noticeable in the high-use summer season. Alternative A would result in a localized and regional, beneficial, long-term, moderate contribution to these cumulative effects.

Conclusion

As Alternative A reflects current conditions, the impacts would be negligible. Cumulative effects of Alternative A, when combined with other past, present, and reasonably foreseeable actions, would be localized and regional, beneficial, short to long term, seasonal, and minor to major. Alternative A would result in a localized and regional, beneficial, long-term, moderate contribution to these cumulative effects.

ALTERNATIVE B

Analysis

Alternative B is a no-motor, low-use alternative for the Upper Gorge. Under Alternative B, commercial operations would shift to no-motor equipment. Compared with Alternative A, the total number of commercial user-days would decline by 14%, while the total number of no-motor user-days would increase by 152%. The total number of passengers would decline by 58% while the total number of no-motor passengers would increase by 80%. The number of launches would follow the same pattern with a decline of 58% in the total number and an increase of 102% for non-motor equipment. Maximum group size would drop from 39 to 25 and maximum trip lengths would decline from 18 to 16 in the summer months and no change in the shoulder season. Compared with the other alternatives, Alternative B has the lowest level of use with the smallest number of daily launches, user-days, and total yearly passengers.

The decrease in the total number of user-days (14%) would result in a corresponding projected decrease in commercial river runners' revenue and gross operating profit (revenue minus direct labor costs). In addition, motorized operators would incur significant one-time investments in converting from motorized to non-motorized equipment. However, these investments are small relative to gross revenue, and they would be readily amortized over the term of the contract. The net impact of Alternative B on commercial operators' revenue and gross operating profit is expected to be moderate, adverse, localized and long term, with a seasonal emphasis on the higher use summer months of May through August (user-days increase in the shoulder season).

Under Alternative B, the passenger exchange at Whitmore would not operate and all Bar 10 Ranch revenue from the exchange would be lost. This represents a major and adverse, localized and long term impact to Bar 10 Ranch revenue, with a seasonal emphasis on the busier months of May through September.

Eliminating helicopter exchanges at Whitmore would result in a loss in revenue to the Hualapai Tribe and the net number of takeouts at Diamond Creek is expected to decline slightly. Together, the economic impact to Hualapai Tribal revenue is estimated to be a gain. The impact to the tribe would be minor and adverse, as it represents between 2% and 10% of its total revenue from river operations. The impacts would be localized and long term, with a greater impact during the busier months of May through September.

An analysis of regional impacts based on Hjerpe and Kim (2003) indicates that the total (i.e., direct, indirect and induced) effects on the regional economy of Alternative B would amount to a decrease in output of \$4.9 million and a loss of 83 jobs. These decreases represent a negligible,

long term impact on the regional economy. Small, specialized suppliers and certain specialized communities (e.g., Marble Canyon) might experience greater impacts.

Mitigation of Effects

Adverse impacts to commercial operators' revenue and gross profit may be mitigated in several ways through the concessions contracting process. Reductions in franchise fees might be one form of mitigation for loss of operators' revenue. Costs of conversion to new equipment (new investment) could be mitigated through a phase-in of non-motor equipment as the current motor equipment is depreciated or requires replacement or by offering a reduced fee during the initial investment period. Reductions in Bar 10 Ranch revenue may not be mitigated. Alternative B's effects on Hualapai tribal revenue or regional economic spending do not require mitigation as they are minor and negligible, respectively.

Cumulative Effects

Specific effects from past, present, and reasonably foreseeable actions are discussed earlier in this chapter. The combined effects from the operation of Glen Canyon Dam, the implementation of "Commercial Operating Requirements," and accessibility and cost of services at Diamond Creek and Whitmore create a favorable socioeconomic environment for commercial operators, their passengers, and localized communities that depend on river-related revenue. To some extent, noncommercial passengers also derive benefit from these effects, as well. Overall these direct and indirect effects are localized and regional, beneficial, short to long term, seasonal, and minor to major.

While Alternative B would result in considerable reductions to revenue for several sources, river operations would still generate substantial revenue. Cumulatively, the effects of Alternative B, when combined with other past, present, and reasonably foreseeable actions, would be localized and regional, beneficial, short to long term, seasonal, and minor to moderate. Alternative B would result in localized and regional, both beneficial and adverse, long-term, moderate contributions to these cumulative effects.

Conclusion

Moderate adverse long term impacts to commercial river-runners' revenue and gross operating profit and major adverse long term impacts to Bar 10 Ranch revenue are expected from Alternative B. In addition, commercial river runners that currently offer motorized trips would face substantial, one-time conversion costs, which would be readily amortized over the term of the contract. Economic impacts to Hualapai tribal revenues would be minor, adverse and long term. Impacts on the regional economy would be negligible. Cumulative effects of Alternative B, when combined with other past, present, and reasonably foreseeable actions, would be localized and regional, beneficial, short to long term, seasonal, and minor to moderate. Alternative B would result in localized and regional, both beneficial and adverse, long-term, moderate contributions to these cumulative effects.

ALTERNATIVE C

Analysis

Alternative C is a high-use, no-motor alternative for the Upper Gorge. Under Alternative C, commercial operations would shift to no-motor equipment and a winter use season would be opened. Compared with Alternative A, the total number of commercial user-days would increase by up to 48%, while the total number of no-motor user-days would increase by up to 330%. The total number of passengers would decline by an estimated 6% while the total number of no-motor passengers would increase by as much as 302%. The number of launches would follow the same pattern with a decrease of up to 5% in the total number and an increase of up to 263% for non-motor equipment. Maximum group size would drop from 39 to 30 and maximum trip lengths would decline from 18 to 16 in the summer months and no change in the shoulder season.

The substantial increase in the total number of user-days (48%) would result in a corresponding projected increase in commercial river runners' revenue and gross operating profit (revenue minus direct labor costs). Motorized operators would, however, incur significant one-time investments in converting from motorized to non-motorized equipment, investments that would be easily amortized over the life of the contract. The net impact of Alternative C on commercial operators' revenue and gross operating profit is expected to be major, beneficial, localized and long term, with a seasonal emphasis on the shoulder and winter seasons.

Alternative C is a no-motor alternative and no helicopter exchanges at Whitmore would be authorized. Hiking exchanges would be limited to 2,500 persons in and 2,500 persons out annually. The net effect of these changes would result in a localized, adverse, long-term, major impact to Bar 10 Ranch revenue, with a seasonal emphasis on the busier months of May through September.

The elimination of helicopter exchanges at Whitmore would result in a loss of revenue to the Hualapai Tribe. However, the net amount derived from the takeouts at Diamond Creek is estimated to increase. Compared with Alternative A, this alternative is projected to produce a decrease in revenue to the Hualapai Tribe. The net impact to the tribe would be negligible, as it represents less than 2% of its total revenue from river operations. The impact would be localized and long term, with a greater impact during the busier months of May through September.

An analysis of regional impacts based on Hjerpe and Kim (2003) indicates that the total (i.e., direct, indirect and induced) effects on the regional economy of Alternative C would amount to an increase in output of \$15.3 million and a gain of 255 jobs. These increases represent a negligible, long term impact on the regional economy. Small, specialized suppliers and certain specialized communities (e.g., Marble Canyon) might experience greater impacts.

Mitigation of Effects

Beneficial impacts to commercial operators' revenue and gross profit do not require mitigation nor do negligible impacts to Hualapai tribal revenue. Costs of conversion to new equipment could be mitigated through a phase-in of non-motor equipment as the current motor equipment is

depreciated or requires replacement. Costs of conversion to new equipment could also be mitigated by extending fee payment over a longer period or through a graduated or reduced franchise fee over the term of the contract. Reductions in Bar 10 Ranch revenue may not be mitigated. The effects of Alternative C on regional economic spending do not require mitigation as they would be negligible.

Cumulative Effects

Specific effects from past, present, and reasonably foreseeable actions are discussed earlier in this chapter. The combined effects from the operation of Glen Canyon Dam, the implementation of “Commercial Operating Requirements,” and accessibility and cost of services at Diamond Creek and Whitmore create a favorable socioeconomic environment for commercial operators, their passengers, and localized communities that depend on river-related revenue. To some extent, noncommercial passengers also derive benefit from these effects, as well. Overall these direct and indirect effects are localized and regional, beneficial, short to long term, seasonal, and minor to major.

While Alternative C would result in considerable reductions to revenue for operations at Whitmore, river operations would still generate substantial revenue. Cumulatively, the effects of Alternative C, when combined with other past, present, and reasonably foreseeable actions, would be localized and regional, beneficial, short to long term, seasonal, and minor to major. Alternative C would result in localized and regional, both beneficial and adverse, long-term, moderate contributions to these cumulative effects.

Conclusion

Major beneficial long term impacts to commercial river-runners’ revenue and gross operating profit and major adverse long term impacts to Bar 10 Ranch revenue would result from Alternative C. In addition, commercial river runners that currently offer motorized trips would face substantial, one-time conversion costs, which would be readily amortized over the term of the contract. Economic impacts to Hualapai tribal revenues would be negligible. Impacts to the regional economy would be negligible. Cumulative effects of Alternative C, when combined with other past, present, and reasonably foreseeable actions, would be localized and regional, beneficial, short to long term, seasonal, and minor to major. Alternative C would result in localized and regional, both beneficial and adverse, long-term, moderate contributions to these cumulative effects.

ALTERNATIVE D

Analysis

Alternative D is an eight-month mixed motor season (summer and winter) and a four-month non-motor season (spring and fall) alternative for the section of river between Lees Ferry and Diamond Creek. Compared with Alternative A, the total number of commercial user-days would increase by up to 21%, while the total number of no-motor user-days would increase by up to

46%. Motor user-days would decline by an estimated 21% during the summer and shoulder seasons but, with the added winter season, total motor user-days would experience an estimated 6% reduction. The total number of passengers would decline by as much as 21%. The total number of motor passengers would decline by up to 37% and the number of no-motor passengers would increase by as much as 34%. The total number of launches would decline by up to 5% with a decline for motor users of up to 29% and an increase of up to 47% for non-motor equipment. Maximum group size would decline from 39 to 25 for non-motor and 43 to 25 for motor users. For motor users, maximum trip lengths would decline from 18 to 10 in the summer and shoulder seasons and from 30 to 18 in the winter. For non-motor users, maximum trip lengths would decrease from 18 to 16 in the summer, 21 to 18 in the shoulder, and 30 to 21 in the winter seasons. Passenger exchanges at Whitmore would be accomplished through hiking and would be limited to 2,500 in and 2,500 out annually.

The increase in the total number of user-days (21%) would result in a corresponding projected increase in commercial river runners' revenue and gross operating profit (revenue minus direct labor costs). The impact of Alternative D on commercial operators' revenue and gross operating profit is expected to be major, beneficial, localized and long term, with a seasonal emphasis on the shoulder and winter seasons.

There would be no helicopter exchanges at Whitmore; hiking exchanges would be limited to 2,500 persons in and 2,500 persons out annually. The impact to Bar 10 Ranch revenue would be major, adverse, localized and long term, with a seasonal emphasis on the busier months of May through September.

The loss of passenger exchange and helicopter related revenue would result in a loss to the Hualapai Tribe. The number of commercial and noncommercial takeouts at Diamond Creek, however, is projected to increase, producing additional revenue. Compared with Alternative A, total revenues to the tribe are expected to decrease. This would create a minor adverse impact, as it represents between 2% and 10% of its total revenue from river operations. The impact would be localized and long term, with a greater impact during the busier months of May through September.

An analysis of regional impacts based on Hjerpe and Kim (2003) indicates that the total (i.e., direct, indirect and induced) effects on the regional economy of Alternative D would amount to an increase in output of \$7.6 million and a gain of 127 jobs. These increases represent a negligible, long term impact on the regional economy. Small, specialized suppliers and certain specialized communities (e.g., Marble Canyon) might experience greater impacts.

Mitigation of Effects

Increases in commercial operators' revenue and gross profit and negligible changes to regional spending do not require mitigation, nor does the minor impact on Hualapai tribal revenue under this alternative. The losses to Bar 10 Ranch revenue may not be mitigated.

Cumulative Effects

Specific effects from past, present, and reasonably foreseeable actions are discussed earlier in this chapter. The combined effects from the operation of Glen Canyon Dam, the implementation of “Commercial Operating Requirements,” and accessibility and cost of services at Diamond Creek and Whitmore create a favorable socioeconomic environment for commercial operators, their passengers, and localized communities that depend on river-related revenue. To some extent, noncommercial passengers also derive benefit from these effects, as well. Overall these direct and indirect effects are localized and regional, beneficial, short to long term, seasonal, and minor to major.

While Alternative D would result in considerable reductions to revenue for operations at Whitmore, river operations would still generate substantial revenue. Cumulatively, the effects of Alternative D, when combined with other past, present, and reasonably foreseeable actions, would be localized and regional, beneficial, short to long term, seasonal, and minor to major. Alternative D would result in localized and regional, both beneficial and adverse, long-term, moderate contributions to these cumulative effects.

Conclusion

Major beneficial long term impacts to commercial river-runners’ revenue and gross operating profit would result from Alternative D. Bar 10 Ranch revenue would experience a major adverse long term impact. Economic impact to Hualapai tribal revenue would be minor, adverse and long term. Impacts on the regional economy would be negligible. Cumulative effects of Alternative D, when combined with other past, present, and reasonably foreseeable actions, would be localized and regional, beneficial, short to long term, seasonal, and minor to major. Alternative D would result in localized and regional, both beneficial and adverse, long-term, moderate contributions to these cumulative effects.

ALTERNATIVE E

Analysis

Alternative E proposes a six-month mixed motor and a six-month non-motor alternative for the section of the river between Lees Ferry and Diamond Creek. This alternative also has small noncommercial groups for the period March through October (except September). Compared with Alternative A, the total number of commercial user-days would increase by 2%, with the motor users increasing by 4% and the non-motor users declining by 1%. The total number of passengers would decline by 15% with the motor passengers decreasing by 19% and the non-motor passengers by 1%. The total number of launches would decline by 5%; motor launches would decline by 9% and non-motor launches would increase by 8%. Maximum group size would drop from 43 to 31 for motor users and from 39 to 25 for non-motor users. Maximum trip lengths would decline from 18 to 8 days for the motor users and from 18 to 14 (summer) and 21 to 16 (shoulder) for non-motor users.

The increase in the total number of user-days (2.1%) would result in a corresponding projected increase in commercial river runners' revenue and gross operating profit (revenue minus direct labor costs). The impact of Alternative E on commercial operators' revenue and gross operating profit is expected to be minor, beneficial, localized and long term, with a seasonal emphasis on the shoulder season.

Under Alternative E, helicopter exchanges at Whitmore would be capped at 2,500 in and 2,500 out. Passenger exchanges at Whitmore, currently at 10,300 per year, are not capped. Compared with Alternative A, Alternative E would have major, adverse, localized and long term impacts on Bar 10 Ranch revenue, with a seasonal emphasis on the busier months of May through September.

With helicopter exchanges at Whitmore declining to 5,000, the Hualapai Tribe would experience a loss of revenue. The projected number of Diamond Creek takeouts would increase and produce a gain. The net effect of Alternative E on Hualapai Tribal revenue would be a gain and produce an economic impact that is negligible, as it represents less than 2% of its total revenue from river operations. The impact would be localized and long term, with a greater impact during the busier months of May through September.

An analysis of regional impacts based on Hjerpe and Kim (2003) indicates that the total (i.e., direct, indirect and induced) effects on the regional economy of Alternative E would amount to an increase in output of \$3.5 million and a gain of 57 jobs. These increases represent a negligible, long term impact on the regional economy. Small, specialized suppliers and certain specialized communities (e.g., Marble Canyon) might experience greater impacts.

Mitigation of Effects

Increased commercial operators' revenue and gross profit and negligible impacts to Hualapai tribal revenue do not require mitigation. The adverse impact to Bar 10 Ranch revenue may not be mitigated. No mitigation is required for the regional economy because the impact would be negligible.

Cumulative Effects

Specific effects from past, present, and reasonably foreseeable actions are discussed earlier in this chapter. The combined effects from the operation of Glen Canyon Dam, the implementation of "Commercial Operating Requirements," and accessibility and cost of services at Diamond Creek and Whitmore create a favorable socioeconomic environment for commercial operators, their passengers, and localized communities that depend on river-related revenue. To some extent, noncommercial passengers also derive benefit from these effects, as well. Overall these direct and indirect effects are localized and regional, beneficial, short to long term, seasonal, and minor to major.

While Alternative E would result in considerable reductions to revenue for operations at Whitmore, river operations would still generate substantial revenue. Cumulatively, the effects of Alternative E, when combined with other past, present, and reasonably foreseeable actions,

would be localized and regional, beneficial, short to long term, seasonal, and minor to major. Alternative E would result in localized and regional, both beneficial and adverse, long-term, moderate contributions to these cumulative effects.

Conclusion

Minor beneficial long term impacts to commercial river-runners' revenue and gross operating profit would result from Alternative E. Bar 10 Ranch revenue would experience a major adverse long term impact. Impacts on Hualapai tribal revenue would be negligible. Impacts to the regional economy would be negligible. Cumulative effects of Alternative E, when combined with other past, present, and reasonably foreseeable actions, would be localized and regional, beneficial, short to long term, seasonal, and minor to major. Alternative E would result in localized and regional, both beneficial and adverse, long-term, moderate contributions to these cumulative effects.

ALTERNATIVE F

Analysis

Alternative F proposes a six-month mixed motor and a six-month non-motor alternative for the section of the river between Lees Ferry and Diamond Creek. This alternative also has small noncommercial groups for the period March through October (except September). Compared with Alternative A, Alternative F proposes the total number of commercial user-days would increase by up to 14% with the motor users increasing by an estimated 4% and the non-motor users would decline by an estimated 1%. The total number of passengers would decline by as much as 1% with the motor passengers decreasing by up to 6% and the non-motor passengers by as much as 15%. The total number of launches would increase by up to 7%; motor launches would increase by as much as 3% and non-motor launches would increase by up to 17%. Maximum group size would drop from 43 to 30 for motor users and from 39 to 30 for non-motor users. Maximum trip lengths would decline from 18 to 10 days for the motor users and from 18 to 16 (summer) and 21 to 18 (shoulder) for non-motor users. Helicopter exchanges at Whitmore would be conducted during the six-month motor season with an annual total of 3,400 passengers in and 6,600 out.

The increase in the total number of user-days (13.8%) would result in a corresponding projected increase in commercial river runners' revenue and gross operating profit (revenue minus direct labor costs). The impact of Alternative F on commercial operators' revenue and gross operating profit is expected to be moderate, beneficial, localized and long term, with a seasonal emphasis on the shoulder and winter seasons.

Under Alternative F, the annual number of helicopter exchanges at Whitmore would be 3% less than under current conditions. The impact of Alternative F on Bar 10 Ranch revenue is expected to be negligible, localized and long term, with a seasonal emphasis on the busier months of May through September.

As the number of helicopter exchanges would decrease only slightly from current levels and projected increases in the number of takeouts at Diamond Creek could bring in additional revenue, the net impact of Alternative F on Hualapai tribal revenue is negligible, as it represents less than 2% of its total revenue from river operations. The impact would be localized and long term, with a greater impact during the busier months of May through September.

An analysis of regional impacts based on Hjerpe and Kim (2003) indicates that the total (i.e., direct, indirect and induced) effects on the regional economy of Alternative F would amount to an increase in output of \$6.5 million and a gain of 107 jobs. These increases represent a negligible, long term impact on the regional economy. Small, specialized suppliers and certain specialized communities (e.g., Marble Canyon) might experience greater impacts.

Mitigation of Effects

Increased commercial operators' revenue and gross profit do not require mitigation. The adverse impact to Bar 10 Ranch revenue may not be mitigated. No mitigation is required for Hualapai tribal revenue or the regional economy, as the impact would be negligible.

Cumulative Effects

Specific effects from past, present, and reasonably foreseeable actions are discussed earlier in this chapter. The combined effects from the operation of Glen Canyon Dam, the implementation of "Commercial Operating Requirements," and accessibility and cost of services at Diamond Creek and Whitmore create a favorable socioeconomic environment for commercial operators, their passengers, and localized communities that depend on river-related revenue. To some extent, noncommercial passengers also derive benefit from these effects, as well. Overall these direct and indirect effects are localized and regional, beneficial, short to long term, seasonal, and minor to major.

While Alternative F would result in considerable reductions to revenue for operations at Whitmore, river operations would still generate substantial revenue. Cumulatively, the effects of Alternative F, when combined with other past, present, and reasonably foreseeable actions, would be localized and regional, beneficial, short to long term, seasonal, and minor to major. Alternative F would result in localized and regional, both beneficial and adverse, long-term, moderate contributions to these cumulative effects.

Conclusion

Moderate beneficial long term impacts to commercial operators' revenue and gross operating profit would result from Alternative F. Impacts to Bar 10 Ranch and Hualapai tribal revenue would be negligible. Impacts to the regional economy would be negligible. Cumulative effects of Alternative F, when combined with other past, present, and reasonably foreseeable actions, would be localized and regional, beneficial, short to long term, seasonal, and minor to major. Alternative F would result in localized and regional, both beneficial and adverse, long-term, moderate contributions to these cumulative effects.

ALTERNATIVE G

Analysis

Alternative G is an eight-month (March through October) mixed motor and a four-month (November through February) non-motor alternative for the section of the river between Lees Ferry and Diamond Creek. Compared with Alternative A, Alternative G proposes the total number of commercial user-days would increase by 2%, with the motor users increasing by 4% and the non-motor users would decline by 1%. The total number of passengers would increase by 4%, with motor passengers increasing by 5% and non-motor passengers by 1%. The total number of launches would increase by 6%; motor launches would increase by 7% and non-motor launches by 2%. Maximum group size would drop from 43 to 40 for motor users and from 39 to 30 for non-motor users. Maximum trip lengths would decline from 18 to 8 days for the motor users and from 18 to 14 (summer) and 21 to 16 (shoulder) for non-motor users.

The increase in the total number of user-days (2.1%) would result in a corresponding projected increase in commercial river runners' revenue and gross operating profit (revenue minus direct labor costs). The impact of Alternative G on commercial operators' revenue and gross operating profit is expected to be minor, beneficial, localized and long term, with a seasonal emphasis on the shoulder season.

The period for helicopter exchanges at Whitmore would be lengthened to the proposed eight-month motorized season and the total number of exchanges increased by approximately 6%. Compared to Alternative A, the net impact of Alternative G on Bar 10 Ranch revenue is expected to be minor, beneficial, localized and long term, with a seasonal emphasis on the busier months of May through September.

The increase in the number of exchanges would result in a gain in revenue to the Hualapai Tribe. The projected number of Diamond Creek takeouts also increases and produces an increase in revenue. Compared with Alternative A, the net economic impact of Alternative G is minor and beneficial, as it represents between 2% and 10% of its total revenue from river operations. The impact would be localized and long term, with a greater impact during the busier months of May through September.

An analysis of regional impacts based on Hjerpe and Kim (2003) indicates that the total (i.e., direct, indirect and induced) effects on the regional economy of Alternative G would amount to an increase in output of \$4.1 million and a gain of 66 jobs. These increases represent a negligible, long term impact on the regional economy. Small, specialized suppliers and certain specialized communities (e.g., Marble Canyon) might experience greater impacts.

Mitigation of Effects

Increased commercial operators' revenue and gross profit, increased Bar 10 Ranch revenue, increased Hualapai tribal revenue, and negligible impacts to the regional economy do not require mitigation.

Cumulative Effects

Specific effects from past, present, and reasonably foreseeable actions are discussed earlier in this chapter. The combined effects from the operation of Glen Canyon Dam, the implementation of “Commercial Operating Requirements,” and accessibility and cost of services at Diamond Creek and Whitmore create a favorable socioeconomic environment for commercial operators, their passengers, and localized communities that depend on river-related revenue. To some extent, noncommercial passengers also derive benefit from these effects, as well. Overall these direct and indirect effects are localized and regional, beneficial, short to long term, seasonal, and minor to major.

Cumulatively, the effects of Alternative G, when combined with other past, present, and reasonably foreseeable actions, would be localized and regional, beneficial, short to long term, seasonal, and minor to major. Alternative G would result in a localized and regional, beneficial, long-term, moderate to major contribution to these cumulative effects.

Conclusion

Minor beneficial long term impacts to commercial operators’ revenue and gross operating profit would result from Alternative G. Bar 10 Ranch revenue and Hualapai tribal revenue would also experience minor beneficial long term impacts. Impacts to the regional economy would be negligible. Cumulatively, the effects of Alternative G, when combined with other past, present, and reasonably foreseeable actions, would be localized and regional, beneficial, short to long term, seasonal, and minor to major. Alternative G would result in a localized and regional, beneficial, long-term, moderate to major contribution to these cumulative effects.

ALTERNATIVE H (NPS PREFERRED ALTERNATIVE)

Analysis

Alternative H is a six-month (March through August) mixed motor and a six-month non-motor alternative for the section of the river between Lees Ferry and Diamond Creek. Compared with Alternative A, Alternative H would reduce the maximum number of trips and people at one time and would increase the annual total number of user discretionary hours. Launches per day would be reduced to a maximum of six. Maximum group sizes would be reduced, along with 16-person trips, noncommercial groups of 8 would be allowed only during the summer months. Maximum trip lengths would be reduced for all types of trips. For March through October, user-day limits would increase for both commercial and noncommercial users; most of that increase would occur during the shoulder seasons. Total user-days would increase by 2%, compared to current conditions.

Helicopter exchanges at Whitmore would be allowed during the four-month summer season up to a total of 5,000 passengers out and 5,000 passengers in; hiking exchanges would be allowed during the shoulder seasons for a total of 2,500 passengers in and 2,500 out.

The increase in the total number of user-days (2.1%) would result in a corresponding projected increase in commercial river runners' revenue and gross operating profit (revenue minus direct labor costs). The impact of Alternative H on commercial operators' revenue and gross operating profit is expected to be minor, beneficial, localized and long term, with a seasonal emphasis on the shoulder season.

Under Alternative H, 10,000 helicopter passengers could be exchanged at Whitmore provided that 5,000 transfer in and the same number transfer out. (Presently, about 10,300 exchanges occur with about 6,800 ending and 3,500 beginning their trips at Whitmore.) In addition, 2,500 hikers could also exchange. The net effect of Alternative H on Bar 10 Ranch revenue is likely to be major, beneficial, localized and long term, with a seasonal emphasis on the busier months of May through September.

The reduction of 300 exchanges at Whitmore results in a revenue loss to the Hualapai Tribe. The projected number of Diamond Creek takeouts increases under this alternative, producing a revenue gain. Compared with Alternative A, the net impact of Alternative H on Hualapai Tribal revenue is an increase in revenue. This economic impact would be negligible, as it represents less than 2% of its total revenue from river operations. The impact would be localized and long term, with a greater impact during the busier months of May through September.

An analysis of regional impacts based on Hjerpe and Kim (2003) indicates that the total (i.e., direct, indirect and induced) effects on the regional economy of Alternative C would amount to an increase in output of \$2.7 million and a gain of 43 jobs. These increases represent a negligible, long term impact on the regional economy. Small, specialized suppliers and certain specialized communities (e.g., Marble Canyon) might experience greater impacts.

Mitigation of Effects

Increased commercial operators' revenue and gross profit, increased Bar 10 Ranch revenue, and negligible impacts to Hualapai tribal revenue and the regional economy do not require mitigation.

Cumulative Effects

Specific effects from past, present, and reasonably foreseeable actions are discussed earlier in this chapter. The combined effects from the operation of Glen Canyon Dam, the implementation of "Commercial Operating Requirements," and accessibility and cost of services at Diamond Creek and Whitmore create a favorable socioeconomic environment for commercial operators, their passengers, and localized communities that depend on river-related revenue. To some extent, noncommercial passengers also derive benefit from these effects, as well. Overall these direct and indirect effects are localized and regional, beneficial, short to long term, seasonal, and minor to major.

Cumulatively, the effects of Alternative H, when combined with other past, present, and reasonably foreseeable actions, would be localized and regional, beneficial, short to long term,

seasonal, and minor to major. Alternative H would result in a localized and regional, beneficial, long-term, moderate to major contribution to these cumulative effects.

Conclusion

Minor beneficial long term impacts on commercial operators' revenue and gross operating profit would result from Alternative H. Bar 10 Ranch revenue would experience major beneficial long term impacts. Impacts to Hualapai tribal revenue would be negligible. Impacts to the regional economy would be negligible. Cumulative effects of Alternative H, when combined with other past, present, and reasonably foreseeable actions, would be localized and regional, beneficial, short to long term, seasonal, and minor to major. Alternative H would result in a localized and regional, beneficial, long-term, moderate to major contribution to these cumulative effects.

IMPACT ANALYSIS — LOWER GORGE ALTERNATIVES

ANALYSIS COMMON TO ALL ALTERNATIVES

Estimating Future Use Levels

The Lower Gorge alternatives for the *Colorado River Management Plan* prescribe maximum use limits for future river use below Diamond Creek. To aid in comparisons between the alternatives, net revenues for the Hualapai Tribe are projected at these limits. Revenues thus represent the maximum earning capacity of that alternative should that service operate at 100 percent of the limits for each day during the season or year.

Projections for HHR revenue are presented as net revenue amounts. Net revenue is the product of the price of the trip (after commissions and discounts) times the maximum number of trips permitted daily for that alternative times the number of days in the operating season or year. No operational expenses are deducted from these figures. They offer a comparison among the alternatives as to the potential extent of the business; they do not represent the projected amount available to the Grand Canyon Resort Corporation or the Hualapai Tribal budget from that alternative.

Projections for revenue from the pontoon boat operations are also presented in net revenue amounts. However, the expenses incurred by the Hualapai Tribe are negligible as the tours are run by third-party pontoon boat operators that pay the Grand Canyon Resort Corporation royalties for the right to operate the contract. Net revenue figures, in this case, do represent a good estimate for amount available to the Grand Canyon Resort Corporation under each alternative.

Economic Impacts on River Rafters

Socioeconomic impacts to commercial and noncommercial river rafters would be the same for all Lower Gorge alternatives because none of the actions proposed under these alternatives

would increase the river use fees or otherwise be expected to directly increase the cost to noncommercial rafters using the Lower Gorge. While the Hualapai Tribe may increase its future tribal land access fees, these would be administered solely by the tribe and, as such, would be independent of the *Colorado River Management Plan*. Therefore no economic impacts to noncommercial or commercial rafters are considered under the Lower Gorge alternatives.

Economic Impacts on Commercial Rafting Operators

Lower Gorge river use by commercial operators is predominantly limited to continuation trips by the Upper Gorge commercial operators and HRR operations (which are analyzed separately below). Most continuation trips consist of short one- or two-day trips below Diamond Creek to take outs at Lake Mead. These trips would either travel unassisted or may meet up with jetboats for more rapid transfer off the river. Under the Lower Gorge alternatives, commercial rafting operations would continue similar to existing conditions or change slightly depending on operations in the Lees Ferry reach (economic impacts are analyzed above). No changes in operating requirements or in future rafting use are expected to be associated with the Diamond Creek alternatives.

Other factors, such as future Lake Mead water levels or future Hualapai Tribe take out and other user fees, may also affect future continuation trip use levels. However, these factors are independent of the *Colorado River Management Plan* and therefore do not represent plan-related impacts.

Noncommercial Launches at Diamond Creek

Currently, more than 1,000 noncommercial passengers launch from Diamond Creek annually. No changes to Lower Gorge noncommercial use are proposed in the *Draft Environmental Impact Statement*; therefore the Lower Gorge alternatives would be expected to have any impact on future noncommercial use levels.

Continuation Trip Revenues

Currently, only commercial continuation trips traveling below Diamond Creek choosing to use tribal lands on “river left” of the Colorado River above the high water line (e.g., typically for hiking or camping use) are required to pay use fees to the tribe. According to the Hualapai Tribe financial and use records (Wegner, fax communication, June 2003), no fees are currently being collected from commercial continuation trips. Although the Hualapai Tribe is currently in discussion with the National Park Service seeking to collect future use fees from all continuation trips, resolution of the issue is currently considered a non-plan related action. Therefore, no economic impact to tribal revenues from future continuation trip user fees are associated with these alternatives.

Land-and-Leave Helicopter Tours

Short “champagne” helicopter landings (land-and-leave tours) operate year-round from Grand Canyon West to the Quartermaster helipads. These tours – more than 19,000 passengers in 2003 -- are operated by commercial tour operators under agreement with the Hualapai Tribe. The *Colorado River Management Plan* has no management jurisdiction over helicopter canyon trips. Therefore, no changes to these trips are considered in the plan and, as such, no economic impacts are attributable to the plan.

Regional Economic Impacts from Changes in Visitor Spending

Commercial and noncommercial river runners contribute less than 1 percent of total regional economic output and employment, thus their current economic impact is negligible. The substantial growth projected with the build-out of Grand Canyon West suggest considerable increases in local expenditures and employment in the Lower Gorge. The regional economic effects of Alternatives 2-5 are expected to be more modest, however, in spite of their major beneficial impact on Hualapai tribal revenue.

Due to the Lower Gorge’s close links with the Las Vegas economy, which is outside the region, much of the impact of the increases in spending projected in Alternatives 2-5 is expected to flow back to the Las Vegas area. The impact of these changes on the Las Vegas economy is negligible. The intensity and timing of this impact differ for each alternative and depend on the Hualapai Tribe’s ability to market their services at the projected levels and on the build-out schedule for Grand Canyon West.

CUMULATIVE IMPACTS

As a part of the Hualapai Tribe’s long-range economic development efforts, Grand Canyon Resort Corporation has prepared a land use plan that includes construction of and improvements to numerous tourist-related facilities for Grand Canyon West, which is located on tribal lands west of Peach Springs. Estimates of annual visitation in the plan range up to 750,000 unscheduled travelers and an unspecified number of scheduled travelers. Local area effects from future development will depend on the phasing of the construction projects and the number of visitors attracted to Grand Canyon West. Currently, Grand Canyon west offers, among other tour opportunities, short helicopter landings (look-and-leave tours) that operate year-round from Grand Canyon West to helipads on tribal lands in the Quartermaster area. These tours, with more than 19,000 passengers in 2003) are operated by commercial tour operators under agreement with the Hualapai Tribe. The National Park Service has no management jurisdiction over Grand Canyon West or the air trips that originate from it. While some river-based activities are analyzed in the Lower Gorge alternatives, all other Grand Canyon West activities and development are analyzed independently as a cumulative effect. Localized effects to the Hualapai Tribe from projected Grand Canyon West build-outs, visitation, job growth, and income are beneficial, long term, year-round, and major. These projections would have a beneficial, long-term, year-round, negligible to minor effect on the regional economy.

ALTERNATIVE 1 (CURRENT CONDITIONS)

Analysis

HRR Operations. The tribe currently operates commercial rafting trips launching at Diamond Creek. Most of these are single-day trips finishing at Quartermaster where passengers are flown by helicopter to Grand Canyon West. HRR day trips currently operate from March through October and are limited to 80 passengers daily during both the peak (May through September) and the non-peak seasons. There is no limit on the number of passengers on HRR overnight trips.

Pontoon Trips. Pontoon trips are single-day, scenery-oriented tours that combine a helicopter flight from the Grand Canyon West airstrip to a helipad along the Colorado River, a short pontoon boat ride on the river, and a return flight to Grand Canyon West. Pontoon trips operate year-round without any limit on the maximum number of passengers. The daily average for these trips is 160 passengers per day (188 during the peak season, 130 during the non-peak), according to figures provided by the Hualapai Tribe.

Grand Canyon National Park Entrance Fees. Currently, the park does not collect entrance fees from visitors entering the park from Hualapai tribal lands for either the HRR trips or the pontoon trips. This lack of enforcement results in foregone NPS revenue estimated at up to \$650,000 per year. If enforced, these entrance fees would be borne by the Hualapai Tribe and its commercial operators, and would likely be passed onto the visitors. The increase in price could impact total revenue due to elasticity of demand.

Regional Impact. The Hualapai Tribe's river operations currently have a negligible impact on the regional economy as a whole.

Mitigation of Effects

No mitigation is necessary under Alternative 1.

Cumulative Effects

Localized effects to the Hualapai Tribe from projected Grand Canyon West build-outs, visitation, job growth, and income would be beneficial, long term, year-round, and major. These projections would have a beneficial, long-term, year-round, negligible to minor effect on the regional economy.

Cumulatively, the effects of Alternative 1, when combined with other past, present, and reasonably foreseeable actions, would be localized, beneficial, long term, year-round, and major for the Hualapai Tribe, and beneficial, long term, year-round, and negligible to minor for the regional economy. Alternative 1 would result in a beneficial contribution to these cumulative effects that on a local basis would be long term and moderate to major, and on a regional basis would be long term and negligible to minor.

Conclusion

No change to future HRR or pontoon operations would be associated with this alternative. Therefore, Alternative 1 would have a negligible, localized and long term impact. Cumulative effects of Alternative 1, when combined with other past, present, and reasonably foreseeable actions, would be localized, beneficial, long term, year-round, and major for the Hualapai Tribe, and beneficial, long term, year-round, and negligible to minor for the regional economy. Alternative 1 would result in a beneficial contribution to these cumulative effects that on a local basis would be long term and moderate to major, and on a regional basis would be long term and negligible to minor.

ALTERNATIVE 2

Analysis

HRR Operations. Under Alternative 2, HRR operations would run year-round. Maximum use limits would be 48 passengers per day in the peak season and 24 passengers per day in the non-peak season for the HRR day trips. For the HRR overnight trips, a maximum of 24 passengers per day would be allowed year-round. At maximum permitted use levels for the peak and non-peak seasons, net revenue is projected to increase by nearly 500%. This increase would result in a beneficial, long-term, major effect for the Hualapai Tribe.

Pontoon Trips. Under Alternative 2, pontoon trips would be eliminated and the Hualapai Tribe would experience a loss of revenue. This loss would result in an adverse, long-term, major effect for the Hualapai Tribe.

Grand Canyon National Park Entrance Fees. If the park enforced the collection of entrance fees from visitors coming from Hualapai tribal lands for either the HRR trips or the pontoon trips under Alternative 2, it would recover currently foregone NPS revenue estimated at up to \$250,000 per year. If enforced, these entrance fees would be borne by the Hualapai Tribe and its commercial operators and would likely be passed onto the visitors. The increase in price could impact total revenue due to elasticity of demand.

Regional Impact. The Hualapai Tribe's river operations would continue to have a negligible impact on the regional economy as a whole.

Mitigation of Effects

As the net economic impact of Alternative 2 would be beneficial, no mitigation would be necessary.

Cumulative Effects

Localized effects to the Hualapai Tribe from projected Grand Canyon West build-outs, visitation, job growth, and income would be beneficial, long term, year-round, and major. These projections

would have a beneficial, long-term, year-round, negligible to minor effect on the regional economy.

Cumulatively, the effects of Alternative 2, when combined with other past, present, and reasonably foreseeable actions, would be localized, beneficial, long term, year-round, and major for the Hualapai Tribe, and beneficial, long term, year-round, and negligible to minor for the regional economy. Alternative 2 would result in a beneficial contribution to these cumulative effects that on a local level would be long term and moderate to major, and on a regional level would be long term and negligible to minor.

Conclusion

The net impact of Alternative 2 on Hualapai tribal revenue is projected to be an increase of more than 100%. This would represent a major, beneficial, localized and long term economic impact, as it represents more than 20% of estimated current Hualapai Tribal revenue from river operations. The impact would be greatest during the peak months of May through September. Cumulative effects of Alternative 2, when combined with other past, present, and reasonably foreseeable actions, would be localized, beneficial, long term, year-round, and major for the Hualapai Tribe, and beneficial, long term, year-round, and negligible to minor for the regional economy. Alternative 2 would result in a beneficial contribution to these cumulative effects that on a local level would be long term and moderate to major, and on a regional level would be long term and negligible to minor.

ALTERNATIVE 3

Analysis

HRR Operations. Alternative 3 proposes maximum use limits of 72 passengers per day (peak) and 48 passengers per day (non-peak) for the HRR day trips. For the HRR overnight trips, a maximum of 48 passengers per day would be allowed year-round. At maximum use rates, Alternative 3 projects a net revenue increase of more than 1,000%. This increase would be a beneficial, long-term, major effect for the Hualapai Tribe.

Pontoon Trips. Pontoon boats would operate at a maximum daily limit of 400 passengers. Pontoon trip revenue at maximum use levels could increase by more than 150%. This increase would be a beneficial, long-term, major effect for the Hualapai Tribe.

Grand Canyon National Park Entrance Fees. If the park enforced the collection of entrance fees from visitors coming from Hualapai tribal lands for either HRR trips or pontoon trips, it would recover currently foregone NPS revenue estimated at up to \$1.9 million per year under Alternative 3. If enforced, these entrance fees would be borne by the Hualapai Tribe and its commercial operators, and they would likely be passed onto the visitors. The increase in price could impact total revenue due to elasticity of demand.

Regional Impact. The Hualapai Tribe's river operations would continue to have a negligible impact on the regional economy as a whole.

Mitigation of Effects

As the net economic impact of Alternative 3 would be beneficial, no mitigation would be necessary.

Cumulative Effects

Localized effects to the Hualapai Tribe from projected Grand Canyon West build-outs, visitation, job growth, and income would be beneficial, long term, year-round, and major. These projections would have a beneficial, long-term, year-round, negligible to minor effect on the regional economy.

Cumulatively, the effects of Alternative 3, when combined with other past, present, and reasonably foreseeable actions, would be localized, beneficial, long term, year-round, and major for the Hualapai Tribe, and beneficial, long term, year-round, and minor for the regional economy. Alternative 3 would result in a beneficial contribution to these cumulative effects that on a local level would be long term and major, and on a regional level would be long term and minor.

Conclusion

Under Alternative 3, the projected increase in HRR and pontoon trip revenues totals more than 500%, a major, beneficial, localized and long term impact, as it represents more than 20% of estimated current Hualapai tribal revenue from river operations. The impact would be greatest during the peak months of May through September. Cumulative effects of Alternative 3, when combined with other past, present, and reasonably foreseeable actions, would be localized, beneficial, long term, year-round, and major for the Hualapai Tribe, and beneficial, long term, year-round, and minor for the regional economy. Alternative 3 would result in a beneficial contribution to these cumulative effects that on a local level would be long term and major, and on a regional level would be long term and minor.

ALTERNATIVE 4 (NPS PREFERRED ALTERNATIVE)

Analysis

HRR Operations. Maximum use limits for the HRR day trips would be 96 passengers per day in the peak season and 56 passengers per day in the non-peak season. For the HRR overnight trips, the maximum would be 48 passengers per day in the peak season and 16 passengers per day in the non-peak season. At maximum use rates, Alternative 4 projects a net revenue increase of more than 700%. This increase would be a beneficial, long-term, major effect for the Hualapai Tribe.

Pontoon Trips. Pontoon boats would operate at maximum daily limit of 150 passengers. Pontoon trip revenue at maximum use levels could decrease by approximately 3%. This decrease would be an adverse, long-term, negligible effect for the Hualapai Tribe.

Grand Canyon National Park Entrance Fees. If the park enforced the collection of entrance fees from visitors coming from Hualapai tribal lands for either HRR trips or pontoon trips, it would recover currently foregone NPS revenue estimated at up to \$950,000 per year under Alternative 4. If enforced, these entrance fees would be borne by the Hualapai Tribe and its commercial operators, and they would likely be passed onto the visitors. The increase in price could impact total revenue due to elasticity of demand.

Regional Impact. The Hualapai Tribe's river operations would continue to have a negligible impact on the regional economy as a whole.

Mitigation of Effects

As the net economic impact of Alternative 4 is beneficial, no mitigation is necessary.

Cumulative Effects

Localized effects to the Hualapai Tribe from projected Grand Canyon West build-outs, visitation, job growth, and income would be beneficial, long term, year-round, and major. These projections would have a beneficial, long-term, year-round, negligible to minor effect on the regional economy.

Cumulatively, the effects of Alternative 4, when combined with other past, present, and reasonably foreseeable actions, would be localized, beneficial, long term, year-round, and major for the Hualapai Tribe, and beneficial, long term, year-round, and minor for the regional economy. Alternative 4 would result in a beneficial contribution to these cumulative effects that on a local level would be long term and major, and on a regional level would be long term and minor.

Conclusion

Under Alternative 4 the projected increase in HRR and pontoon trip revenues totals nearly 300%, a major, beneficial, localized and long term impact, as it represents more than 20% of estimated current Hualapai tribal revenue from river operations. The impact would be greatest during the peak months of May through September. Cumulative effects of Alternative 4, when combined with other past, present, and reasonably foreseeable actions, would be localized, beneficial, long term, year-round, and major for the Hualapai Tribe, and beneficial, long term, year-round, and minor for the regional economy. Alternative 4 would result in a beneficial contribution to these cumulative effects that on a local level would be long term and major, and on a regional level would be long term and minor.

ALTERNATIVE 5 (HUALAPAI TRIBE PROPOSED ACTION)***Analysis***

HRR Operations. Like Alternative 4, maximum use limits for HRR day trips under Alternative 5 would be 96 passengers in the peak season and 56 passengers per day in the non-peak season. For the HRR overnight trips maximum use limits would be 48 passengers per day (peak) and 16 passengers per day (non-peak). At maximum use rates, a net revenue increase under Alternative 5 is projected at more than 700%. This increase would be a beneficial, long-term, major effect for the Hualapai Tribe.

Pontoon Trips. Alternative 5 differs from Alternative 4 on the maximum number of pontoon boat passengers per day. Under Alternative 5 pontoon boats would operate at a maximum daily limit of 960 passengers, and pontoon trip revenue at maximum levels is expected to increase by more than 500%. This increase would be a beneficial, long-term, major effect for the Hualapai Tribe.

Grand Canyon National Park Entrance Fees. If the park enforced the collection of entrance fees from visitors coming from Hualapai tribal lands for either HRR trips or pontoon trips, it would recover currently foregone NPS revenue estimated at up to \$3.9 million per year under this alternative. If enforced, these entrance fees would be borne by the Hualapai Tribe and its commercial operators, and would likely be passed onto the visitors. The increase in price could impact total revenue due to elasticity of demand.

Regional Impact. The Hualapai Tribe's river operations would continue to have a negligible impact on the regional economy as a whole.

Mitigation of Effects

As the net economic impact of Alternative 5 would be beneficial, no mitigation would be necessary.

Cumulative Effects

Localized effects to the Hualapai Tribe from projected Grand Canyon West build-outs, visitation, job growth, and income would be beneficial, long term, year-round, and major. These projections would have a beneficial, long-term, year-round, negligible to minor effect on the regional economy.

Cumulatively, the effects of Alternative 5, when combined with other past, present, and reasonably foreseeable actions, would be localized, beneficial, long term, year-round, and major for the Hualapai Tribe, and beneficial, long term, year-round, and minor for the regional economy. Alternative 5 would result in a beneficial contribution to these cumulative effects that on a local level would be long term and major, and on a regional level would be long term and minor.

Conclusion

Under Alternative 5, the projected increase in HRR and pontoon trip revenues totals nearly 600%, a major beneficial long term impact, as it represents more than 20% of estimated current Hualapai tribal revenue from river operations. The impact would be greatest during the peak months of May through September. Cumulative effects of Alternative 5, when combined with other past, present, and reasonably foreseeable actions, would be localized, beneficial, long term, year-round, and major for the Hualapai Tribe, and beneficial, long term, year-round, and minor for the regional economy. Alternative 5 would result in a beneficial contribution to these cumulative effects that on a local level would be long term and major, and on a regional level would be long term and minor.

IMPACTS ON PARK MANAGEMENT AND OPERATIONS

ISSUES

Impacts to biological, physical, paleontological, and cultural resources from visitor use in the river corridor are managed by the National Park Service, as well as other federal agencies (U. S. Geological Survey, U. S. Fish and Wildlife Service), state agencies (Arizona Game and Fish Department, State Historic Preservation Office) and tribal agencies. Changes in management of visitor use on the Colorado River from Lees Ferry to Lake Mead may affect the operations of these entities.

Since 2000, Grand Canyon National Park, Lake Mead National Recreation Area, and the Hualapai Tribe have met to address management issues from National Canyon (RM 165) to the Grand Canyon / Lake Mead boundary (RM 277) by developing mutually agreed on operational and management protocols for the “area of cooperation.”

Management zones for the Lower Gorge reflect a broader range of recreational activities and increased use intensity in Zones 2, 3 and 4. The National Park Service and the Hualapai Tribe are cooperatively managing the impacts of increased use, including enforcement of boating regulations, commercial activities, natural and cultural resource management and potential user conflicts.

Park staffing levels may not be adequate to manage changes in river use or river use issues.

GUIDING REGULATIONS AND POLICIES

The Division of Visitor and Resource Protection oversees emergency medical services and river patrol operations, including enforcement of environmental and safety regulations. NPS *Management Policies 2001* (NPS 2000d) provide guidance for visitor safety and emergency response (sec. 8.2.5) and law enforcement (sec. 8.3). Management of commercial activities, boating and environmental regulations are addressed in 36CFR 7.4.

The Concessions Division currently manages 16 concession contracts for commercial river trips between Lees Ferry, in Glen Canyon National Recreation Area, and Temple Bar, in Lake Mead National Recreation Area. Concession operations are subject to the provisions of the 1998 National Park Service Concessions Management Improvement Act; NPS regulations published at 36 CFR Part 51; Chapter 10 of NPS *Management Policies 2001* (NPS 2000d); and Director's Order 89A: Concession Management. Changes in the management of commercial river use resulting from adoption of the final plan would be reflected in prospectuses for future commercial river concession contracts.

The Science Center is responsible for managing the natural and cultural resources in the river corridor. NPS *Management Policies 2001* (NPS 2000d) provide guidance for Natural Resources

Management (Chapter 4); Cultural Resources Management (Chapter 5); Wilderness Preservation and Management (Chapter 6); and Use of Parks (Chapter 8).

The Division of Maintenance Trail Crew oversees maintenance of trails and facilities in the backcountry and along the Colorado River corridor. The following sections of NPS *Management Policies 2001* (NPS 2000d) provide guidance for these activities: “Trails in Wilderness” (sec. 6.3.10.2), “Backcountry Use” (sec. 8.2.2.4), and “Hiking Trails” (sec. 9.2.3.2). The park’s *Backcountry Management Plan* (NPS 1988) describes trail maintenance standards.

Guidelines for interpretation and educational programs are provided in Chapter 7 of NPS *Management Policies 2001* (NPS 2000d), which direct the National Park Service to disseminate the mission and goals of Grand Canyon National Park, and the history and significance of its resources, to the public.

MANAGEMENT OBJECTIVES FOR PARK MANAGEMENT AND OPERATIONS

Objectives for park operations are derived from the *General Management Plan* objectives and are as follows: (1) manage and monitor visitor use and park resources to preserve and protect natural and cultural resources and ecosystem processes, and to preserve and maintain a wilderness experience or primitive experience; (2) establish indicators and standards for desired visitor experiences and resource conditions, monitor their condition, and take action to meet the standards if they are not being met; and (3) provide a variety of primitive recreational opportunities consistent with wilderness and NPS policies on accessibility.

The *Colorado River Management Plan* has the following objective for park management and operations: ensure sufficient fiscal and human resources are available to implement the revised river management plan.

Current Grand Canyon National Park river corridor programs and operations are summarized in Chapter 3. At present, short-term project funding supports most of the programs. Implementing new river management operations would require short-term funding for implementation and long-term funding to ensure that management objectives, including the protection of park resources and quality visitor experiences, are met.

METHODOLOGY FOR ANALYZING EFFECTS TO PARK MANAGEMENT AND OPERATIONS

The general process for assessing impacts is discussed in the “Introduction” to Chapter 4. For this analysis, park management and operations are the human and fiscal resources available to protect and preserve natural and cultural resources along the Colorado River corridor and provide for safe and enjoyable visitor experiences. The discussion of impacts to park management and operations focuses on rangers and other staff that ensure visitor and employee safety and opportunities for quality experiences, as well as the ability of the resource management staff and trail crew to protect and preserve resources at current staffing and funding

levels. Park staff evaluated the impacts of each alternative and based the analysis on current park management and operations presented in Chapter 3.

IMPACT THRESHOLDS

Effects on park management and operations are characterized for each alternative based on impact thresholds below. Each alternative was evaluated to determine if effects are direct or indirect.

Intensity

Negligible — Colorado River management and operations would not be affected or the effect would not be apparent to park staff or the public.

Minor — Adverse: Impacts would be measurable but would not have an appreciable effect on or consequences for park management and operations.

Beneficial: Impacts would result in short-term improvements in park management and operations.

Moderate — Adverse: Impacts would be readily apparent and would result in a measurable change in park management or operations in a manner noticeable to staff and the public.

Beneficial: Impacts would result in short- to long-term improvement in park management and operations.

Major — Adverse: Impacts would be readily apparent and would result in a substantial change in river management or operation in a manner noticeable to staff and the public.

Beneficial: Impacts would result in long-term improvement in park management and operations.

Context

Localized — Effects would be realized at specific sites or locations.

Regional — Effects would be realized at several sites and/or locations and would be applicable to one or more management zones.

Duration

Short term — Effects would occur in a period less than one year, based on short-term funding.

Long term — Effects would be realized for the life of the plan (up to 10 years).

Timing

Effects would be realized year-round, especially in shoulder (spring and fall) and winter months where use patterns and levels vary from current management.

MITIGATION OF EFFECTS

Reasonable mitigations for impacts to park management and operations include the following:

- Increase staff and funding to support visitor and employee safety through education and enforcement of environmental and boating regulations.
- Increase staff and funding to support resource inventory and monitoring programs.
- Increase staff and funding to support resource restoration activities, including campsite and trail maintenance and rehabilitation, native and non-native vegetation management, sensitive and endangered species protections, and archeological site preservation.
- Develop and foster partnerships to inventory and monitor resources and to mitigate impacts to natural and cultural resources.

CUMULATIVE IMPACTS

Cumulative impacts on park management and operations were determined by combining the impacts of each alternative with other past, present and reasonably foreseeable future action (see the “Introduction” to Chapter 4 for detailed list of all actions).

ASSUMPTIONS

The general assumptions used for analysis of effects for each alternative are discussed in the “Introduction” to Chapter 4. Assumptions that specifically relate to the alternatives in this document and their effect on park management and operations are presented below.

- In order to mitigate site-specific resource concerns from changes in visitor use, it is expected that additional funding and staff would be needed. Site-specific concerns would be addressed under each resource impact topic.
- Currently, river operations primarily occur from March through October. Resource management and trails maintenance trips may occur year-round, but fieldwork occurs primarily during from fall through spring. Implementation of a plan that includes year-round recreational use would, at a minimum, involve increased visitor education, river trip orientations and river patrols.
- The impacts to park management and operations are directly proportional to the level of visitation. Trips at one time, people at one time, group size, trip length, and launch patterns estimate the level of visitation.

ACTIONS COMMON TO ALL ALTERNATIVES

The following actions are common to all alternatives, including Lees Ferry Alternative A, No Action:

- Administrative river trips, including park management activities, patrols, research, educational and other use, would continue to be evaluated through the park review and

approval process. Administrative use of motorized transportation and equipment would be evaluated under the minimum tool policy.

- If a new noncommercial permit system is selected, additional staff time and resources would be needed to design and implement it. Short-term impacts would be major and include substantial costs and increased staff time to transition from the current waiting list system to the preferred option. Implementation of a new noncommercial permit system would result in major short-term impacts and moderate long-term impacts to park management and operations. These impacts would be adverse in terms of park staffing and costs, but beneficial in terms of providing quality customer service.
- If a new concession contract or contracts were awarded, additional staff time would be required to administer and supervise such contracts.

IMPACT ANALYSIS — LEES FERRY ALTERNATIVES

ALTERNATIVE A (CURRENT CONDITIONS)

Analysis

Management of recreational use would continue to allow large group sizes, long trips, and spikes in daily launches and use intensity (see Table 4-1). User-days would remain capped at current levels, which would result in approximately the same number of total annual recreational users.

River management programs and operations would continue at approximately the same level as present. The same level of service, monitoring, oversight, and management activities would continue. There would be no changes in the ability to ensure employee and visitor health and safety; the ability to protect and preserve park resources; and the ability to provide quality visitor services and experiences.

Most river management activities have been funded through short-term project funding and extensive use of volunteers and grants, rather than long-term base funding. Each division has a small number of permanent staff that is involved with river management. Approximately 10 FTEs (i.e., full time equivalents, or the amount of work equivalent to one-person year) in the Visitor and Resource Protection Division are directly devoted to river patrols, permits administration, and river trip put-in (Lees Ferry) and takeout (Meadview) operations. Normal recurring costs related directly to river management are more difficult to quantify in other park divisions, because these duties are related to parkwide activities and programs. It is estimated that the other park divisions currently devote 6-7 FTEs to river operations; volunteers and cooperators donate at least twice that many additional FTEs on projects in the river corridor.

However, most of the monitoring, resource preservation and maintenance activities along the river corridor are not being accomplished. For example, inventory and monitoring programs prescribed in the 1989 *Colorado River Management Plan* and 1997 Resource Management Plan have only been conducted on a limited basis due to funding and staffing constraints, which are expected to continue.

Because Glen Canyon and Lake Mead national recreation areas have many of the same funding and staffing constraints as Grand Canyon National Park, cooperative management efforts between national park system units at Lees Ferry and Meadview would continue to be limited. The river education facility at Lees Ferry is inadequate, but no improvements would be expected.

The 60-mile stretch of river from National Canyon to Diamond Creek is within the Area of Cooperation where the National Park Service and the Hualapai Tribe are cooperating on resource management. These cooperative efforts would continue under the No Action Alternative. The National Park Service and the Hualapai Tribe would also cooperatively manage congestion and public safety at the Diamond Creek takeout area.

Mitigation of Effects

Actions required to mitigate effects would include all of the mitigation measures identified in the “Methodology for Analyzing Effects to Park Management and Operations: Mitigation of Effects” section above. Additional mitigation actions would include:

- Continue current efforts to seek short-term funding to support resource management efforts, including cooperative funding with other federal agencies and institutions.
- Continue cooperative resource monitoring efforts with the Hualapai Tribe.
- Provide NPS support to the Hualapai Tribe at Diamond Creek for visitor education and launch ramp management.

Reasonable implementation of mitigation measures would require additional staffing and funding.

Cumulative Effects

The impacts of Glen Canyon Dam on beaches would continue to have adverse, long-term, major impacts on resource management, especially river corridor archeological site preservation, and vegetation and campsite management. There would be minor adverse impacts to river corridor campsites shared by backpackers and river users, which would not be addressed. The current management would continue to have direct, short- and long-term, beneficial and adverse impacts on cooperative management efforts with the Hualapai Tribe within the Area of Cooperation. Continued use of the Whitmore helicopter pad would have negligible effects on park operations; impacts to current management of Grand Canyon Parashant National Monument would be negligible at the Whitmore trailhead area. Cumulatively, the effects of Alternative A, when combined with other past, present, and reasonably foreseeable actions, would result in regional to localized, adverse, short- to long-term, seasonal to year round, moderate to major effects on park operations. Alternative A would result in a localized, adverse, short- to long-term, seasonal to year-round, minor to moderate contribution to these cumulative effects.

Conclusion

There would be little or no change from current park management and operations. Deficiencies in current staffing and budget would continue and not all of the activities prescribed in Grand Canyon visitor use and resource management plans would be implemented. This would result in adverse impacts that would be negligible in the short term and moderate in the long term; impacts would be measurable and noticeable to park staff and the public. If staffing and budget were increased to levels needed to address all of the mandates, there would be measurable, beneficial, long-term, moderate impacts on park operations and the public. Cumulative effects of Alternative A, when combined with other past, present, and reasonably foreseeable actions, would result in regional to localized, adverse, short- to long-term, seasonal to year round, moderate to major effects on park operations. Alternative A would result in a localized, adverse, short- to long-term, seasonal to year-round, minor to moderate contribution to these cumulative effects.

ALTERNATIVE B

Analysis

Recreational motor trips would be prohibited and group sizes, daily launch, user-days, and probable total yearly passengers would be the lowest (see Table 4-1). Trip lengths would be reduced from current conditions resulting in lower trips at one time. Passenger exchanges at Whitmore would not be allowed. The number of noncommercial summer launches would double compared to current conditions, but generally Alternative B would have the lowest use and smallest group sizes of any alternative.

Shoulder season and winter launches would not be significantly increased over the average current condition, so staffing and funding would need to be increased only slightly at those times to achieve similar levels of coverage as Lees Ferry Alternative A. However, current staffing and funding is considered inadequate to do all the activities that are mandated.

The reduced numbers of river users and trips could proportionally reduce visitor health and safety related-problems, and reduce the number of emergency situations on the river that park rangers respond to. There would be fewer ranger patrols for education and concession evaluations in the high-use seasons. Winter patrols would increase from current conditions.

Reduced numbers of trips and group size would reduce impacts to park resources from river recreation. Mitigation of impacts, such as social trail obliteration and vegetation damage, would be more successful under this alternative. There would be a continued need for administrative river trips for routine maintenance activities (e.g., trail maintenance, revegetation) resource monitoring, and other management actions. Administrative use of motorized craft for research or other management activities would be evaluated through the minimum tool analysis. However, because this is a no-motor alternative, it would be more difficult to gain approval for administrative motor use.

Mitigation of Effects

Actions required to mitigate effects would include all of the mitigation measures identified in the Mitigation of Effects section above. Additional mitigation actions would include:

- Continue current efforts to seek short-term funding to support resource management efforts, including cooperative funding with other federal agencies and institutions.
- Conduct river patrols during winter months.
- Expand resource monitoring and maintenance programs to address year-round use.
- Continue cooperative resource monitoring efforts with the Hualapai Tribe.
- Provide NPS support to the Hualapai Tribe at Diamond Creek for visitor education and launch ramp management.

Reasonable implementation of mitigation measures would require additional staffing and funding.

Cumulative Effects

The impacts of Glen Canyon Dam on beaches would continue to have adverse, long-term, major impacts on resource management, especially river corridor archeological site preservation, and vegetation and campsite management. However, lower levels of recreational use would not exacerbate impacts compared to current conditions. There would be minor beneficial impacts to management of backcountry use as a result of lower river use. Cooperative management efforts with the Hualapai Tribe would be beneficial and moderate due to reduced resource impacts on Tribal lands, and reduced crowding and conflicts at the Diamond Creek takeout area.

Cumulatively, the effects of Alternative B, when combined with other past, present, and reasonably foreseeable actions, would result in regional to localized, adverse, short- to long-term, seasonal to year round, moderate to major effects on park operations. Alternative B would result in a localized, beneficial, short- to long-term, seasonal to year-round, negligible to minor contribution to these cumulative effects.

Conclusion

Alternative B would require minor to moderate changes from current conditions. This would result in short-term minor to long-term moderate adverse impacts on park operations. Staffing levels would remain at current levels, although river patrols and Lees Ferry operations would occur throughout the year (compared to current 8-9 month operations). Resource monitoring and routine management activities would continue at current levels, but the mitigation of natural and cultural resource impacts would probably be more successful with lower use, resulting in beneficial long-term effects on resources in the river corridor. Cumulative effects of Alternative B, when combined with other past, present, and reasonably foreseeable actions, would result in regional to localized, adverse, short- to long-term, seasonal to year round, moderate to major effects on park operations. Alternative B would result in a localized, beneficial, short- to long-term, seasonal to year-round, negligible to minor contribution to these cumulative effects.

ALTERNATIVE C

Analysis

Commercial and noncommercial non-motor trips would be allowed year-round. Commercial group size would be reduced, and maximum trip lengths would be shorter than current conditions. This alternative would have the highest number of winter and shoulder user-days, and winter passengers. Only Alternative G would have a higher number of recreational passengers in spring and fall. This alternative would nearly double the number of noncommercial launches and allow only half the current number of commercial summer launches. Both sectors would have an equal number of launches in the summer and winter. Shoulder season use would be increased for commercial launches. Winter launches would be more than double the current number of launches.

The total number of recreational trips from March to October would be reduced from current. The smaller commercial group size would result in a reduction in recreational use. The increase in recreational use during the winter months would increase the potential for visitor health and safety related-problems and the need for park staff to respond to emergency situations. Ranger patrols for education and concession evaluations would be similar to current levels, but extended through the winter.

While commercial group size and annual number of commercial passengers would be reduced, the number of annual trips, recreational users and user-days would increase over the current situation. The increased number of visitors in the shoulder and winter months would increase the potential for impacts to park resources. High-use levels would offset any mitigation of impacts, such as social trail obliteration and vegetation damage. Administrative river trips would be needed for routine maintenance activities (e.g., trail maintenance, revegetation) resource monitoring, and other management actions, possibly at higher levels in the winter months.

Under this alternative, trips could conduct hiking-only exchanges at Whitmore. The Whitmore Trail is about 1.3 miles from the river to the rim and boundary with the Grand Canyon-Parashant National Monument (Lake Mead National Recreation Area). The trail would require improvement and more frequent maintenance than at present.

Administrative use of motorized craft for research or other management activities would be evaluated through the minimum tool analysis. However, because this is a no-motor alternative, it would be more difficult to gain approval for administrative motor use.

Mitigation of Effects

Actions required to mitigate effects would include all of the mitigation measures identified in the Mitigation of Effects section above. Additional mitigation actions would include:

- Continue current efforts to seek short-term funding to support resource management efforts, including cooperative funding with other federal agencies and institutions.
- Conduct river patrols during winter months.

- Expand resource monitoring and maintenance programs to address year-round use.
- Continue cooperative resource monitoring efforts with the Hualapai Tribe.
- Provide NPS support to the Hualapai Tribe at Diamond Creek for visitor education and launch ramp management.
- Cooperatively manage Whitmore trailhead area with Grand Canyon-Parashant National Monument and Lake Mead National Recreation Area. Address human health and safety issues by providing basic facilities, such as shade structures and primitive toilets.

Reasonable implementation of mitigation measures would require additional staffing and funding.

Cumulative Effects

The impacts of Glen Canyon Dam on beaches would continue to have adverse, long-term, major impacts on resource management, especially river corridor archeological site preservation, and vegetation and campsite management. The increased levels of use from fall through spring may exacerbate resource impacts compared to current conditions. There would be negligible impacts to management of backcountry use. Increased winter use would have a moderate impact on NPS and Hualapai Tribe cooperative management efforts. Resource protection and monitoring programs would need to be expanded. The non-motor river trips would likely result in increased takeouts at Diamond Creek, resulting in moderate to major effects on launch area management. Whitmore hiker exchanges would have major effects on current management of the Whitmore trailhead within the Grand Canyon-Parashant National Monument. The trailhead is accessed by a primitive 9-mile road from the Bar 10 Ranch. There are no facilities or water at the trailhead area. Cumulatively, the effects of Alternative C, when combined with other past, present, and reasonably foreseeable actions, would result in regional to localized, adverse, short- to long-term, seasonal to year round, moderate to major effects on park operations. Alternative C would result in a localized, adverse, short- to long-term, seasonal to year-round, minor to moderate contribution to these cumulative effects.

Conclusion

Alternative C would require moderate to major changes from current conditions. This would result in short-term major to long-term moderate adverse impacts on park operations. The significant increase in winter use could result in a major impact. The effects would have long-term adverse impacts requiring additional staff and funding to support visitor use management, routine maintenance, and resource monitoring programs. River patrols for visitor education and concessions evaluations would occur throughout the year, and trail maintenance would be more frequent and require additional staff and funding. Resource monitoring would be required at a higher level than current due to the increase in visitor use during from fall through spring. If adequate funding and staff were available to implement this alternative, there would be a short-term adverse impact for implementation, and a long-term beneficial effect on river management programs. Lack of funding or staff would be an adverse impact to park management and operations. Cumulative effects of Alternative C, when combined with other past, present, and reasonably foreseeable actions, would result in regional to localized, adverse, short- to long-term,

seasonal to year round, moderate to major effects on park operations. Alternative C would result in a localized, adverse, short- to long-term, seasonal to year-round, minor to moderate contribution to these cumulative effects.

Alternative D

Analysis

This is a mixed motor and non-motor alternative with the lowest commercial group size. The maximum trip lengths would be shorter than current and motorized use would be allowed in winter and summer only. The number of daily summer launches would be similar to the current average and includes 3-4 small (8 person) noncommercial launches each week.

Increased winter use would increase the potential for visitor health and safety related problems and the need for park staff to respond to emergency situations. Ranger patrols would be similar to current levels during the summer and shoulder months, but would increase in the winter months.

While the commercial group size and annual number of commercial passengers would be reduced, the total number of annual trips, recreational users and user-days increases over current conditions. The increased number of visitors in the shoulder and winter months would increase the potential for impacts to resources, but at a lower level than Alternative C. Mitigation of impacts, such as social trail obliteration and vegetation damage, would not have as great a chance for success compared to current conditions. There would be a continued need for administrative river trips for routine maintenance activities (e.g., trail maintenance, revegetation) resource monitoring, and other management actions, but at higher levels in the winter months.

Trips are permitted to conduct hiking-only exchanges at Whitmore; the trail would require an upgrade and more frequent maintenance than at present.

Mitigation of Effects

Actions required to mitigate effects would include all of the mitigation measures identified in the Mitigation of Effects section above. Additional mitigation actions would include:

- Continue current efforts to seek short-term funding to support resource management efforts, including cooperative funding with other federal agencies and institutions.
- Conduct river patrols during winter months.
- Expand resource monitoring and maintenance programs to address year-round use.
- Continue cooperative resource monitoring efforts with the Hualapai Tribe.
- Provide NPS support to the Hualapai Tribe at Diamond Creek for visitor education and launch ramp management.

- Cooperatively manage Whitmore trailhead area with Grand Canyon-Parashant National Monument and Lake Mead National Recreation Area. Address human health and safety issues by providing basic facilities, such as shade structures and primitive toilets.

Reasonable implementation of mitigation measures would require additional staffing and funding.

Cumulative Effects

The impacts of Glen Canyon Dam on beaches would continue to have adverse, long-term, major impacts on resource management, especially river corridor archeological site preservation, and vegetation and campsite management. The increased levels of use in shoulder and winter months could exacerbate impacts compared to current conditions. Effects of this alternative on backcountry management would be negligible. Resource protection and monitoring programs would need to be expanded. Increased winter use would have a moderate impact on NPS and Hualapai Tribe cooperative management efforts. The NPS management presence at Diamond Creek would be expanded into winter, resulting in moderate effects on launch area management. Cooperative management efforts with the Hualapai Tribe would be beneficial due to reduced resource impacts on Tribal lands and reduced crowding and conflicts at the Diamond Creek takeout area. Whitmore hiker exchanges would have major effects on current management of the Whitmore trailhead within the Grand Canyon-Parashant National Monument. The trailhead is accessed by a primitive 9-mile road from the Bar 10 Ranch. There are no facilities or water at the trailhead area. Cumulatively, the effects of Alternative D, when combined with other past, present, and reasonably foreseeable actions, would result in regional to localized, adverse, short- to long-term, seasonal to year round, moderate to major effects on park operations. Alternative D would result in a localized, adverse, short- to long-term, seasonal to year-round, minor to moderate contribution to these cumulative effects.

Conclusion

Alternative D would require moderate to major changes from current conditions. This would result in short-term moderate to long-term minor adverse impacts on park operations, requiring additional staff and funding to support visitor use management, routine maintenance, and resource monitoring programs. River patrols for visitor education and concessions evaluations would occur throughout the year. Upgrading the Whitmore Trail would have short-term adverse impact on park operations, but long-term beneficial effects. Trail maintenance would be more frequent and require additional staff and funding. Resource monitoring and routine maintenance activities would be required more frequently than current conditions due to the overall increased use. If adequate funding and staff were available to implement this alternative, there would be a short-term adverse impact for implementation, and a long-term beneficial effect on river management programs. Lack of funding or staff would be an adverse impact to park management and operations. Cumulative effects of Alternative D, when combined with other past, present, and reasonably foreseeable actions, would result in regional to localized, adverse, short- to long-term, seasonal to year round, moderate to major effects on park operations. Alternative D would result in a localized, adverse, short- to long-term, seasonal to year-round, minor to moderate contribution to these cumulative effects.

Alternative E**Analysis**

This is a mixed motor and no-motor alternative that would provide winter use opportunities for up to 11 noncommercial trips each week. Alternatives E and G would have the shortest commercial trip lengths during the summer and shoulder months. Under this alternative there would be a difference in commercial motor and oar group sizes. No motors would be allowed from October through March. Whitmore helicopter exchanges would be allowed, but at the lowest levels during the mixed motorized / non-motorized use period.

Increased winter use would increase the potential for visitor health and safety related problems and the need for park staff to respond to emergency situations. Ranger patrols would be similar to current levels during the summer and shoulder months, but would increase in the winter months.

While the commercial group size and annual number of commercial passengers would be reduced, the total number of annual trips, recreational users and user-days would increase over current conditions. The increased number of visitors from fall through spring would increase the potential for impacts to park resources, but at a lower level than Alternative C. Mitigation of impacts, such as social trail obliteration and vegetation damage, would have a greater chance for success under this alternative and would be similar to Alternative D. There would be a continued need for administrative river trips for routine maintenance activities (e.g., trail maintenance, revegetation) resource monitoring, and other management actions, but at higher levels in the winter months.

This alternative would allow Whitmore helicopter exchanges during the mixed motorized / non-motorized period (April-September), but at a level significantly lower than current conditions. Similar to Alternatives C and D, hiking options would be allowed throughout the year, and the Whitmore Trail would require an upgrade and more frequent maintenance than at present.

Mitigation of Effects

Same as Alternative D.

Cumulative Effects

Same as Alternative D. Helicopter passenger exchanges at Whitmore could result in lower hiking use, but the impact to Grand Canyon-Parashant National Monument would be similar.

Conclusion

Alternative E would require moderate to major changes from current conditions. This would result in short-term moderate to long-term minor adverse impacts on park operations, the same as Alternative D. Seasonal use patterns would have an apparent, measurable effect on park staffing and funding levels.

ALTERNATIVE F

Analysis

This is a split year motorized / non-motorized alternative. While non-motorized trips would be allowed year-round, motorized trips are allowed only from January through June. This alternative would have the highest number of daily launches in May and June, and among the highest number of spring launch. Similar to Alternatives C, E and G, there would be a maximum of two daily launches in winter. This alternative would allow for longer motor trips and winter trips for commercial and noncommercial users. It would allow for helicopter exchanges at Whitmore at levels similar to current conditions, but only from January to June. Hiking exchanges at Whitmore would be allowed throughout the year.

Similar to Alternative E, increased winter use would increase the potential for visitor health and safety related problems and the need for park staff to respond to emergency situations. Ranger patrols would be similar to current levels during the summer and shoulder months, but would increase in the winter months.

Mitigation of Effects

Same as Alternative E.

Cumulative Effects

Same as Alternative E. Increased spring use would require better management of the Diamond Creek takeout.

Conclusion

Alternative F would require moderate to major changes from current conditions, similar to Alternatives D and E. This would result in short-term major to long-term moderate adverse impacts on park operations, due to the substantial shift in seasonal use levels (particularly spring). The change in seasonal use patterns would have an apparent and measurable effect on park staffing and funding. If adequate funding and staff were available to implement this alternative, there would be a short-term adverse impact for implementation, and a long-term beneficial effect on river management programs. Lack of funding or staff would be an adverse impact to park management and operations. There would be moderate to major effects from current conditions.

Alternative G

Analysis

This is the highest use alternative. It would allow the largest commercial group size and highest number of daily launches for each season. It would have the shortest noncommercial trip lengths

for summer and shoulder seasons. Helicopter exchanges would be allowed at Whitmore at a rate similar to current conditions, but only from January through August when motorized trips would be allowed. Similar to other alternatives, the Whitmore hiking option is available year-round.

Increased winter and early spring use would increase the potential for visitor health and safety related problems and the need for park staff to respond to emergency situations. The higher number of trips in spring and fall would require a minimum of two additional FTE for patrol to conduct visitor education, enforcement and concession evaluations from March through October. Resource monitoring, routine maintenance (e.g. social trail obliteration, revegetation) and other resource management actions would need to be conducted more frequently, and would need more FTE dedicated to monitoring and mitigating visitor use impacts.

The high levels of use throughout the year would require additional staff to work cooperatively with the Hualapai Tribe to manage the Diamond Creek takeout. Non-motorized takeouts would increase threefold from current levels.

Mitigation of Effects

Actions required to mitigate effects would include all of the mitigation measures identified in the “Mitigation of Effects” section above. Additional mitigation actions would include:

- Continue current efforts to seek short-term funding to support resource management efforts, including cooperative funding with other federal agencies and institutions.
- Conduct river patrols during winter months.
- Expand resource monitoring and maintenance programs to address year-round use.
- Continue cooperative resource monitoring efforts with the Hualapai Tribe.
- Provide NPS support to the Hualapai Tribe at Diamond Creek for visitor education and launch ramp management.
- Cooperatively manage Whitmore trailhead area with Grand Canyon-Parashant National Monument and Lake Mead National Recreation Area. Address human health and safety issues by providing basic facilities, such as shade structures and primitive toilets.

Reasonable implementation of mitigation measures would require additional staffing and funding.

Cumulative Effects

The impacts of Glen Canyon Dam on beaches would continue to have adverse, long-term, major impacts on resource management, especially river corridor archeological site preservation, and vegetation and campsite management. The increased levels of use in shoulder and winter months would exacerbate impacts as compared to current conditions. Effects of increased visitation during shoulder months would have moderate impacts on backcountry management. The increased annual use would have a moderate to major impact on the cooperative NPS and Hualapai Tribe management efforts. Resource protection and monitoring programs would need to be expanded, and management presence at Diamond Creek area would be expanded into

winter. The effects of the Whitmore hiker exchanges would be the same as Alternative F. Cumulatively, the effects of Alternative G, when combined with other past, present, and reasonably foreseeable actions, would result in regional to localized, adverse, short- to long-term, seasonal to year round, moderate to major effects on park operations. Alternative G would result in a localized, adverse, short- to long-term, seasonal to year-round, moderate to major contribution to these cumulative effects.

Conclusion

Alternative G would require major changes from current conditions that would be apparent to park management and the public. This would result in adverse, short- to long-term, adverse impacts on park operations, requiring additional staff and funding to support visitor use management, routine maintenance, and resource monitoring programs. If adequate funding and staff were available to implement this alternative, there would be a short-term adverse impact for implementation, and a long-term beneficial effect on river management programs. Lack of funding or staff would be an adverse impact to park management and operations. Cumulative effects of Alternative G, when combined with other past, present, and reasonably foreseeable actions, would result in regional to localized, adverse, short- to long-term, seasonal to year round, moderate to major effects on park operations. Alternative G would result in a localized, adverse, short- to long-term, seasonal to year-round, moderate to major contribution to these cumulative effects.

ALTERNATIVE H (NPS PREFERRED ALTERNATIVE)

Analysis

This is a mixed motorized / non-motorized alternative with varying commercial group sizes by season. For the summer months, commercial group size would be reduced and noncommercial launches would be increased, yet the total number of recreational users would be similar to current levels. The commercial group size would be reduced to 24 during the shoulder seasons, and only non-motorized use would be allowed from September through March. Whitmore helicopter exchanges would be limited to the summer, and hiking options would be limited during the shoulder seasons.

Increased winter and spring use would increase the potential for visitor health and safety related problems and the need for park staff to respond to emergency situations. Ranger patrols would be similar to current levels during the summer and fall, but would increase in the winter and spring.

The increased number of visitors in the shoulder and winter months increases opportunities for impacts to park resources from river recreation, but at a lower level than Alternatives C, E, F and G. There would be a continued need for administrative river trips for routine maintenance activities (e.g., trail maintenance, revegetation) resource monitoring, and other management actions, but at higher levels in the winter months.

Mitigation of Effects

Actions required to mitigate effects would include all of the mitigation measures identified in the Mitigation of Effects section above. Additional mitigation actions would include:

- Continue current efforts to seek short-term funding to support resource management efforts, including cooperative funding with other federal agencies and institutions.
- Conduct river patrols during winter months.
- Expand resource monitoring and maintenance programs to address year-round use.
- Continue cooperative resource monitoring efforts with the Hualapai Tribe.
- Provide NPS support to the Hualapai Tribe at Diamond Creek for visitor education and launch ramp management.
- Cooperatively manage Whitmore trailhead area with Grand Canyon-Parashant National Monument and Lake Mead National Recreation Area. Address human health and safety issues by providing basic facilities, such as shade structures and primitive toilets.

Reasonable implementation of mitigation measures would require additional staffing and funding.

Cumulative Effects

The impacts of Glen Canyon Dam on beaches would continue to have adverse, long-term, major impacts on resource management, especially river corridor archeological site preservation, and vegetation and campsite management. The increased levels of use in the winter could exacerbate resource impacts compared to current conditions. There would be negligible impacts to management of backcountry use. Increased winter use would have a moderate impact on NPS and Hualapai Tribe cooperative management efforts. Resource protection and monitoring programs would need to be expanded. The NPS management presence at Diamond Creek would be expanded into winter, resulting in moderate effects on launch area management. Cooperative management efforts with the Hualapai Tribe would be beneficial due to reduced resource impacts on Tribal lands and reduced crowding and conflicts at the Diamond Creek takeout area. Whitmore hiker exchanges would have major effects on current management of the Whitmore trailhead within the Grand Canyon-Parashant National Monument. Cumulatively, the effects of Alternative H, when combined with other past, present, and reasonably foreseeable actions, would result in regional to localized, adverse, short- to long-term, seasonal to year round, moderate to major effects on park operations. Alternative H would result in a localized, adverse, short- to long-term, seasonal to year-round, minor to moderate contribution to these cumulative effects.

Conclusion

Alternative H would require moderate to major changes from current conditions that would be apparent to park management and the public. This would result in adverse, short- to long-term, moderate impacts on park operations, requiring additional staff and funding to support visitor use management, routine monitoring, and resource monitoring programs. If adequate funding and

staff were available to implement this alternative, there would be short-term adverse impacts for implementation, and long-term beneficial impacts to river management programs. Cumulative effects of Alternative H, when combined with other past, present, and reasonably foreseeable actions, would result in regional to localized, adverse, short- to long-term, seasonal to year round, moderate to major effects on park operations. Alternative H would result in a localized, adverse, short- to long-term, seasonal to year-round, minor to moderate contribution to these cumulative effects.

IMPACT ANALYSIS — LOWER GORGE ALTERNATIVES

The potential for impacts to park management and operations in the Lower Gorge is based on comparisons among Diamond Creek alternatives 1–5, which are distinct from the Lees Ferry alternatives.

The methodology including impact thresholds, cumulative impacts, and mitigation of effects used for the Lees Ferry alternatives apply to the Diamond Creek alternatives.

ACTIONS COMMON TO ALL ALTERNATIVES

Consistent with the cooperative efforts of the National Park Service and the Hualapai Tribe, the following common management actions apply to all Diamond Creek action alternatives:

- The National Park Service and the Hualapai Tribe evaluate administrative use including NPS resource management, patrols, and research river trips launching from Diamond Creek. Administrative use of motorized equipment and transportation would be evaluated by a minimum tool analysis.
- River trips takeouts and launches at Diamond Creek would be scheduled to reduce congestion and address safety issues, especially during peak use periods. This effort would require cooperative onsite management and would involve offsite education and outreach by the National Park Service and the Hualapai Tribe.
- Daily launch and group size limits for HRR day use and overnight trips would be established. Noncommercial and educational group size limits would be set at 16 and are described in Chapter 2.

ALTERNATIVE 1 (CURRENT CONDITIONS)

Analysis

Current activities and river trip characteristics would remain the same. River trip takeouts at Diamond Creek would be managed similar to present conditions, although with changes to takeout schedules. Group size limits and trip lengths for noncommercial and educational trips are 16 people maximum. HRR day use and overnight trips would have a maximum group size of 100 (all boats launching at once). Upriver travel to Separation Canyon would be allowed; pontoon use in the Quartermaster Area would be limited to levels agreed on between the Hualapai Tribe

and National Park Service in 2000. The Hualapai Tribe placed the existing docks used by HRR and pontoon tours for passenger exchanges. These facilities are temporary and are often moved because of changing river and lake levels. The National Park Service does not manage or maintain the docks.

Park river operations and resource management activities are currently limited below Diamond Creek. Most park ranger patrols takeout at Diamond Creek. In the past 5 years, patrols average one trip per year through the Lower Gorge. The Meadview ranger routinely conducts patrols in the Lower Gorge from Lake Mead to Separation Canyon. One FTE is dedicated to the Lower Gorge management. The primary activities are visitor education, enforcement of boating and environmental regulations and management of takeouts. NPS resource management activities, including monitoring and maintenance, are infrequent and average less than one trip a year. As a result, resource and visitor use data are limited, and NPS management of trails, camps and sensitive resources is rare in this section of the river corridor. Shortages in staffing and funding for river management and operations contribute to the lack of NPS presence in the 51 miles of the Colorado River below Diamond Creek.

Mitigation of Effects

Actions required to mitigate effects would include all of the mitigation measures identified in the Mitigation of Effects section above. Additional mitigation actions would include:

- Develop and implement Lower Gorge resource monitoring and preservation programs in cooperation with the Hualapai Tribe.
- Provide boating, health and safety training opportunities for HRR river guides and boat operators.
- Provide NPS support to the Hualapai Tribe at Diamond Creek for visitor education and launch ramp management.
- Cooperatively design and install a temporary floating dock to accommodate the level of activity agreed to in 2000 and to ensure protection of resources within the river corridor. Implementation would be consistent with federal and state laws and regulations.
- Continue current efforts to seek short-term funding to support resource management efforts, including cooperative funding with other federal agencies and institutions.

Reasonable implementation of mitigation measures would require additional staffing and funding.

Cumulative Effects

The impacts of Glen Canyon Dam would be similar to those discussed under the Lees Ferry alternatives — adverse, long-term, major impacts on resource management, especially river corridor archeological site preservation, and vegetation and campsite management. The NPS river management actions would have direct impacts on the Hualapai Tribe's resource management and river operations. There are beneficial and adverse impacts, and they are described in specific resource impact discussions. The effects of current park management and

operations on Hualapai Tribal and Lake Mead operations would have a major beneficial impact because the park ranger currently conducts frequent patrols to address visitor safety and compliance with boating and environmental regulations. If this activity were to cease, it would be a major adverse impact to Lower Gorge river management. As Lake Mead levels decreased, upriver travel would decrease, and could affect visitor safety and congestion at the South Cove launch area. Cumulatively, the effects of Alternative 1, when combined with other past, present, and reasonably foreseeable actions, would result in regional to localized, adverse, short- to long-term, seasonal to year-round, moderate to major effects on park operations. Alternative 1 would result in a localized, adverse, short- to long-term, seasonal to year-round, minor to moderate contribution to these cumulative effects.

Conclusion

There would be little or no change from current park management and operations. Deficiencies in current staffing and budget would continue and not all of the activities prescribed in park visitor use and resource management plans would be implemented. This would result in adverse, short-term, negligible impacts and adverse, long-term, major impacts that would be measurable and noticeable to park staff and the public. If staffing and budget were increased, this would be a moderate beneficial impact to park operations. Cumulative effects of Alternative 1, when combined with other past, present, and reasonably foreseeable actions, would result in regional to localized, adverse, short- to long-term, seasonal to year-round, moderate to major effects on park operations. Alternative 1 would result in a localized, adverse, short- to long-term, seasonal to year-round, minor to moderate contribution to these cumulative effects.

ALTERNATIVE 2

Analysis

This is the lowest use action alternative for the Lower Gorge. There would be a maximum of five daily launches, including two HRR day use trips. Upriver travel would be restricted above RM 262; jetboat passenger exchanges would take place below this point. Pontoon tours would be prohibited. One campsite would be designated for HRR overnight trips; a low level of campsite development involving vegetation management would be allowed.

The number of recreational passengers launching from Diamond Creek would be reduced from one 10-boat trip of 100 people to three 3-boat trips of 30 people each. Two noncommercial trips could launch, although this use would remain at lower levels during the summer. Compared to Alternative 1, the reduced number of trips during peak summer months would result in less congestion at the Diamond Creek launch area. Limitations on upriver travel (to RM 262) would be a substantial change in NPS patrol operations compared to current limit (RM 240). Upriver travel restrictions impact jetboat services and may result in trips camping one an extra night in the canyon. This would increase user-nights over current conditions and could result in increased campsite impacts. The absence of pontoon boats in the Quartermaster area would be an apparent change in management and operations, especially for enforcement of boating safety regulations. There would continue to be a need for park monitoring and resource management to address impacts to campsites, attraction sites and trails.

Mitigation of Effects

Actions required to mitigate effects would include all of the mitigation measures identified in the Mitigation of Effects section above. Additional mitigation actions would include:

- Develop and implement Lower Gorge resource monitoring and preservation programs in cooperation with the Hualapai Tribe.
- Provide boating, health and safety training opportunities for HRR river guides and boat operators.
- Provide NPS support to the Hualapai Tribe at Diamond Creek for visitor education and launch ramp management.
- Conduct park ranger patrols from Lees Ferry to Lake Mead on a routine basis.
- Continue current efforts to seek short-term funding to support resource management efforts, including cooperative funding with other federal agencies and institutions.

Reasonable implementation of mitigation measures would require additional staffing and funding.

Cumulative Effects

The impacts of Glen Canyon Dam would be similar to those discussed under the Lees Ferry alternatives — adverse, long-term, major impacts on resource management, especially river corridor archeological site preservation, and vegetation and campsite management. NPS river management actions would have direct impacts on the Hualapai Tribe's resource management and river operations. There are beneficial and adverse impacts, and they are described in specific resource impact discussions. The effects of park river management and operations on Hualapai Tribal and Lake Mead operations would have a moderate adverse impact because the park ranger patrols would be less frequent above RM 262. As Lake Mead levels decreased, recreational use from the lake would also decrease, affecting visitor safety and congestion at the South Cove launch area. Cumulatively, the effects of Alternative 2, when combined with other past, present, and reasonably foreseeable actions, would result in regional to localized, adverse, short- to long-term, seasonal to year-round, moderate to major effects on park operations. Alternative 2 would result in a localized, adverse, short- to long-term, seasonal to year-round, minor to moderate contribution to these cumulative effects.

Conclusion

Alternative 2 would require minor to moderate changes from current conditions. This would result in adverse, short-term, major impacts on park operations, and beneficial, long-term, moderate impacts on visitor safety and resource management. There would be a substantial change in river patrol operations due to limits on upriver travel. Patrols in the upper canyon would have to continue below Diamond Creek to cover sections that the Meadview ranger currently patrols. Additional FTEs and funding to support these operations would result in beneficial, long-term, moderate impacts to operations; otherwise, with current staff and funding levels, impacts would be adverse and major. The lack of pontoon tour boats and upriver jetboat

travel for commercial passenger exchange would result in a beneficial, moderate impact to park management due to decreased safety issues and visitor use conflicts. The effects on resource management activities would be moderate, short-term adverse impacts due to the expected increase in camping below RM 262. Otherwise, the effects of this alternative on resource management would be long-term, adverse minor impacts unless additional staffing and funding were allocated to meet the mandates of park resource management and visitor use plans. Cumulative effects of Alternative 2, when combined with other past, present, and reasonably foreseeable actions, would result in regional to localized, adverse, short- to long-term, seasonal to year-round, moderate to major effects on park operations. Alternative 2 would result in a localized, adverse, short- to long-term, seasonal to year-round, minor to moderate contribution to these cumulative effects.

ALTERNATIVE 3

Analysis

There would be a maximum of seven daily launches in the summer, including three HRR day use trips; group size would be reduced to 30 from one trip of 100 people. Two HRR overnight trips could launch each day. Noncommercial trips could launch throughout the year. Two HRR day trips would be allowed during non-peak months. Two campsites would be designated below Separation Canyon for HRR trips with a medium level of campsite development (e.g. vegetation removal and limited storage of supplies). Upriver travel would be restricted above Separation Canyon (RM 240) with a maximum of four jetboat tow-outs each day. This alternative would include commercial jetboat tours permitted by Lake Mead and Grand Canyon. Pontoon tours would be allowed in the Quartermaster area with a maximum of 400 passengers per day. A small floating dock would be allowed near RM 263.

Compared to Alternatives 1 and 2, the increased number of launches would result in more congestion at the Diamond Creek launch area. Limitations on upriver travel (to RM 240) would be the same as current conditions, however the effects of the increased number of trips would be of moderate intensity. There could be short-term adverse impacts to park operations in Zone 2 (Diamond Creek to RM 260) until additional FTE become available. The number of daily pontoon tours would double in Zone 3 compared to Alternative 1. Along with the commercial passenger jetboat services, there would be a maximum of two jetboat tours each day. The level of use, especially in Zone 3, would have a major impact on park ranger patrols. It would require daily interaction with river users to ensure visitor safety, provide education and enforce environmental and boating regulations. The management of the dock facility at RM 263 would require cooperative efforts between the National Park Service and the Hualapai Tribe. The increased daily use would have a direct impact on natural and cultural resources. There would be an increased need for Grand Canyon and Hualapai monitoring and resource management actions to address impacts to camps, attraction sites and trails in the Lower Gorge.

Mitigation of Effects

Actions required to mitigate effects would include all of the mitigation measures identified in the Mitigation of Effects section above. Additional mitigation actions would include:

- Develop and implement Lower Gorge resource monitoring and preservation programs in cooperation with the Hualapai Tribe.
- Provide boating, health and safety training opportunities for HRR river guides and boat operators.
- Provide NPS support to the Hualapai Tribe at Diamond Creek for visitor education and launch ramp management.
- Cooperatively design and install a temporary floating dock to accommodate the level of activity agreed to in 2000 and to ensure protection of resources within the river corridor. Implementation would be consistent with federal and state laws and regulations.
- Hire three additional park staff to support Lower Gorge management to include river patrols, resource management and launch ramp management at Diamond Creek and Lake Mead.
- Continue current efforts to seek short-term funding to support resource management efforts, including cooperative funding with other federal agencies and institutions.

Reasonable implementation of mitigation measures would require additional staffing and funding.

Cumulative Effects

The impacts of Glen Canyon Dam would be similar to those discussed under the Lees Ferry alternatives — adverse, long-term, major impacts on resource management, especially river corridor archeological site preservation, and vegetation and campsite management. Coupled with the river traffic from the upper canyon, the increased number of launches would have direct major impacts on Diamond Creek launch management. NPS river management actions would have direct impacts on the Hualapai Tribe's resource management and river operations. There are beneficial and adverse impacts, and they are described in specific resource impact discussions. The effects of park river management and operations on Hualapai Tribal and Lake Mead operations would have a major impact due to the substantial increase in NPS management presence. As Lake Mead levels decreased, recreational use from the lake would also decrease, affecting visitor safety and congestion at the South Cove launch area. Cumulatively, the effects of Alternative 3, when combined with other past, present, and reasonably foreseeable actions, would result in regional to localized, adverse, short- to long-term, seasonal to year-round, moderate to major effects on park operations. Alternative 3 would result in a localized, adverse, short- to long-term, seasonal to year-round, moderate to major contribution to these cumulative effects.

Conclusion

Alternative 3 would require moderate to major changes from current conditions. This would result in adverse, short- and long-term, major impacts on park operations. There would be a substantial change in river patrol operations due to the increased number of daily launches, jetboat tours and pontoon tours. This would be short term, major, adverse impacts on river patrol operations until more FTEs were secured to conduct additional patrols and manage the Lake

Mead launch ramp. If two additional FTEs were secured, long-term impacts to park operations would be major and beneficial. The impacts on resource management activities would be major, long-term and adverse due to the expected increase in camping and off-river activities, and the need for substantial increases in staffing and funding to manage resources. Installation of a dock at RM 263 for pontoon and HRR passengers would be a short-term major impact to operations of the National Park Service and the Hualapai Tribe, but could be offset by long-term, beneficial impacts of protecting shoreline resources and ensuring visitor safety. Cumulative effects of Alternative 3, when combined with other past, present, and reasonably foreseeable actions, would result in regional to localized, adverse, short- to long-term, seasonal to year-round, moderate to major effects on park operations. Alternative 3 would result in a localized, adverse, short- to long-term, seasonal to year-round, moderate to major contribution to these cumulative effects.

ALTERNATIVE 4 (NPS PREFERRED ALTERNATIVE)

Analysis

The number of HRR day-use launches would not be limited and could vary, although the maximum group size is 40, and the total number of passengers would be capped at 96 for the peak use months. This alternative would allow up to three HRR overnight trips of 20 people. It designates three campsites below Separation Canyon for HRR trips with a low level of campsite development (e.g. vegetation management). Upriver travel would be restricted to Zones 3 and 4, until Lake Mead levels reach full pool. Motorized tow-outs and commercial jetboat services would be allowed from RM 260. During peak use periods, the commercial pick-ups could transport kayakers to RM 273 (near Hualapai boundary) where kayakers begin their downriver trip. Pontoon boat tours would be allowed in the Quartermaster area with a maximum of 150 passengers daily; a small floating dock would be allowed near RM 262.5.

The potential for congestion at Diamond Creek would be similar to Alternatives 1 and 3. Management of river trip takeouts and launches at Diamond Creek would be similar to Alternative 1, but with more scheduling. Similar to Alternative 2, the limitations on upriver travel (to RM 260) compared to current (RM 240) would be a substantial change in Lower Gorge patrol operations, requiring the upper canyon patrols to continue below Diamond Creek. Designating campsites below Separation Canyon on river left for use by HRR trips would be a short-term adverse impact, but would provide long-term major beneficial impacts to the Hualapai Tribe and NPS cooperative river management activities. Pontoon boat tours would be conducted at lower levels than current operations. Management of the dock facility at RM 262.5 would require cooperative efforts between the National Park Service and the Hualapai Tribe. The increased daily use would have a direct impact on natural and cultural resources. There would be an increased need for Grand Canyon and Hualapai monitoring and resource management actions to address impacts to camps, attraction sites and trails in the Lower Gorge.

Mitigation of Effects

Actions required to mitigate effects would include all of the mitigation measures identified in the Mitigation of Effects section above. Additional mitigation actions would include:

- Develop and implement Lower Gorge resource monitoring and preservation programs in cooperation with the Hualapai Tribe.
- Provide boating, health and safety training opportunities for HRR river guides and boat operators.
- Conduct park ranger patrols from Lees Ferry to Lake Mead on a routine basis.
- Provide NPS support to the Hualapai Tribe at Diamond Creek for visitor education and launch ramp management.
- Cooperatively design and install a temporary floating dock to accommodate the level of activity agreed to in 2000 and to ensure protection of resources within the river corridor. Implementation would be consistent with federal and state laws and regulations.
- Continue current efforts to seek short-term funding to support resource management efforts, including cooperative funding with other federal agencies and institutions.

Reasonable implementation of mitigation measures would require additional staffing and funding.

Cumulative Effects

The impacts of Glen Canyon Dam would be similar to those discussed under the Lees Ferry alternatives — adverse, long-term, major impacts on resource management, especially river corridor archeological site preservation, and vegetation and campsite management. Coupled with river traffic from the upper canyon, the increased number of launches would have direct, major impacts on Diamond Creek launch management. Park river management and operations would have a moderate adverse impact on Hualapai tribal operations because the park ranger patrols would occur less frequently above RM 260. It could have a moderate beneficial impact on Hualapai Tribal and Lake Mead operations from the Lake to RM 260 due to the additional time the Meadview ranger would spend in this section of the river. As Lake Mead levels decreased, recreational use from the lake would also decrease, affecting visitor safety and congestion at the South Cove launch area. Cumulatively, the effects of Alternative 4, when combined with other past, present, and reasonably foreseeable actions, would result in regional to localized, adverse, short- to long-term, seasonal to year-round, moderate to major effects on park operations. Alternative 4 would result in a localized, adverse, short- to long-term, seasonal to year-round, moderate contribution to these cumulative effects.

Conclusion

Alternative 4 would require moderate to major changes from current conditions. This would result in adverse, short- to long-term, moderate to major impacts on park operations, and beneficial, long-term, moderate impacts on visitor safety and resource management. There would be a substantial change in the river patrol operations due to limits on upriver travel (described for Alternative 2), at least until Lake Mead reaches full pool. This would have a short-term, major adverse impact and would require upper canyon patrols to continue below Diamond Creek to cover the sections that the Meadview ranger routinely patrols. Additional FTEs and funding to support these operations would result in long-term, moderate beneficial impact to operations;

otherwise, it would be an adverse impact to continue with current staff and funding levels. Limiting upriver patrols to RM 260 would have a direct, beneficial, moderate impact on management activities in Zones 3 and 4. The Meadview ranger would spend more time with educational, enforcement and resource management activities, including off-river patrols and resource monitoring. This may offset the need for increased resource management staff to conduct resource monitoring and management actions in these areas. Decreased pontoon boat traffic in the Quartermaster area would enhance visitor and employee safety. Installation of a dock at RM 262.5 for pontoon and HRR passengers would be a short-term major impact to the NPS and Hualapai Tribe, but could be offset by long-term beneficial effects of protecting shoreline resources (reducing erosions) and ensuring visitor safety. Cumulative effects of Alternative 4, when combined with other past, present, and reasonably foreseeable actions, would result in regional to localized, adverse, short- to long-term, seasonal to year-round, moderate to major effects on park operations. Alternative 4 would result in a localized, adverse, short- to long-term, seasonal to year-round, moderate contribution to these cumulative effects.

ALTERNATIVE 5 (HUALAPAI TRIBE PROPOSED ACTION)

Analysis

Daily launches from Diamond Creek and campsite management actions would be the same as Alternative 4. Upriver travel from Lake Mead would be allowed to RM 273 (Hualapai–Grand Canyon boundary). Pontoon tours would be allowed in the Quartermaster area with a maximum of 960 passengers daily; a large floating dock would be located near RM 262.5.

Management of river trip takeouts and launches at Diamond Creek would be the same as Alternative 4. Campsites management below Separation Canyon on river left for HRR trips would be a short-term, adverse impact to the National Park Service during implementation, but would provide long-term, major beneficial impacts to Hualapai Tribe and NPS management of Lower Gorge activities. Compared to other alternatives, the limits on upriver travel to RM 273 would be a significant change in Lower Gorge patrol operations, requiring upper canyon NPS patrols to continue below Diamond Creek, or NPS patrols to launch from Diamond Creek. Pontoon boat tours would occur at significantly higher levels in the Quartermaster area, and upriver travel from Lake Mead would end. However, there would be an overall increase in river boat traffic. Management of the dock facility at RM 262.5 would require cooperation between the National Park Service and the Hualapai Tribe. The increased daily use would have a direct impact on natural and cultural resources. There would be an increased need for Grand Canyon and Hualapai monitoring and resource management actions to address impacts to camps, attraction sites and trails in the Lower Gorge.

Mitigation of Effects

Actions required to mitigate effects would include all of the mitigation measures identified in the Mitigation of Effects section above. Additional mitigation actions would include:

- Develop and implement Lower Gorge resource monitoring and preservation programs in cooperation with the Hualapai Tribe.

- Provide boating, health and safety training opportunities for HRR river guides and boat operators.
- Conduct park ranger patrols from Lees Ferry to Lake Mead on a routine basis.
- Provide NPS support to the Hualapai Tribe at Diamond Creek for visitor education and launch ramp management.
- Cooperatively design and install a temporary floating dock to accommodate the level of activity agreed to in 2000 and to ensure protection of resources within the river corridor. Implementation would be consistent with federal and state laws and regulations.
- Continue current efforts to seek short-term funding to support resource management efforts, including cooperative funding with other federal agencies and institutions.

Reasonable implementation of mitigation measures would require additional staffing and funding.

Cumulative Effects

The impacts of Glen Canyon Dam would be similar to those discussed under the Lees Ferry alternatives — adverse, long-term, major impacts on resource management, especially river corridor archeological site preservation, and vegetation and campsite management. Coupled with the river traffic from the upper canyon, the increased number of launches would have direct, major impacts on Diamond Creek launch management. NPS river management actions would have direct impacts on the Hualapai Tribe's resource management and river operations. There are beneficial and adverse impacts, and they are described in specific resource impact discussions. The effects of park river management and operations on Hualapai Tribal and Lake Mead operations would have a major adverse impact because Meadview ranger patrols would be limited to below RM 273, and upper canyon ranger patrols would have to patrol below Diamond Creek. As Lake Mead levels decreased, recreational use from the lake would also decrease, affecting visitor safety and congestion at the South Cove launch area. Cumulatively, the effects of Alternative 5, when combined with other past, present, and reasonably foreseeable actions, would result in regional to localized, adverse, short- to long-term, seasonal to year-round, moderate to major effects on park operations. Alternative 5 would result in a localized, adverse, short- to long-term, seasonal to year-round, moderate contribution to these cumulative effects.

Conclusion

Alternative 5 would require major changes from current conditions. This would result in adverse short- to long-term, moderate to major impacts on park operations. There would be a substantial change in the Lower Gorge river patrol operations due to upriver travel limits above RM 273. This would have a long-term, major adverse impact on river patrol operations and would require upper canyon patrols to continue below Diamond Creek; it would limit Meadview ranger patrols to about 5 miles of river within the park. This would also have an adverse impact on visitor safety and resource management activities. Increased pontoon use in the Quartermaster area could be a greater safety concern, but this could be offset by the lack of upriver travel from Lake Mead. Installation of a dock at RM 262.5 for pontoon and HRR passengers would be a short-

term, major impact to the National Park Service and the Hualapai Tribe, but this could be offset by long-term, beneficial impacts of protecting shoreline resources and ensuring visitor safety. Cumulative effects of Alternative 5, when combined with other past, present, and reasonably foreseeable actions, would result in regional to localized, adverse, short- to long-term, seasonal to year-round, moderate to major effects on park operations. Alternative 5 would result in a localized, adverse, short- to long-term, seasonal to year-round, moderate contribution to these cumulative effects.

IMPACTS ON ADJACENT LANDS

ISSUES

As noted in the 1979 *Colorado River Management Plan/EIS*, the river corridor and its recreational use are influenced to varying degrees by agencies and American Indian tribes that administer or manage lands and resources adjacent to Grand Canyon National Park. River running, in turn, has the potential to affect management of these lands and resources. Numerous issues have been identified regarding adjacent lands, both in public scoping and in internal review. The primary issues are described below:

- Glen Canyon is directly affected by the amount of launching activity at Lees Ferry, particularly in the high-use summer season. Congestion can cause logistical problems and delays for parties rigging boats, but does not prevent trips from launching on the day planned. Glen Canyon staff routinely address indirect impacts of downriver use, such as vehicular traffic and parking problems; pressure on campground use; illegal camping near the ramp; and conflicts between downriver users, upriver users, and anglers.
- Trips that do not take out at Diamond Creek continue on to South Cove in Lake Mead. For this reason Lake Mead and the Hualapai Tribe are both directly affected by launch schedules, trip lengths, and group sizes since they ultimately determine the level of use and crowding at the takeouts. Lake Mead and the Hualapai Tribe are also affected by allowable levels of upriver use from Lake Mead into the AOC.
- Impacts on Grand Canyon-Parashant National Monument are related to the number and types of exchanges allowed at the Whitmore exchange. Helicopters exchanges of commercial passengers at the Whitmore helipad and use of fixed-wing aircraft to fly them in and out of Bar 10 Ranch have a localized effect on the soundscape and air quality of the Monument. Additionally, hiking exchanges require maintenance of the Whitmore Trail within the park, which is used to access the rim from the river, and of the primitive roads that offer the only automobile access to neighboring communities.
- Some river recreationists venture onto Navajo Nation lands without the required tribal permit. The level of such trespass is limited by the relative paucity of accessible side canyons, campsites, and attraction sites in this reach. One attraction site, which is particularly sacred to the Navajo Nation and other tribes, is very heavily visited: the Little Colorado River. A considerably lower level of river-related use occurs on other Navajo lands in the river corridor, but trespass still occurs in such places as Jackass Canyon and Eminence Break. The greatest potential for conflicts with Navajo residents, and with land management on the Navajo Reservation, concerns non-permitted use of rim-to-river trails by noncommercial river runners. Adverse impacts resulting from use of these trails may include trespass on Navajo Nation lands, disturbance of local residents on the rim, erosion of unimproved roads, and disturbance of livestock. Other potential impacts to Navajo resources include accumulations of human waste and litter, vandalism, social trailing, and damage to cultural resources. No data exist on the amount of trespass that

occurs or to what degree other types of impact to tribal lands can be attributed to river use.

- Some river recreationists venture onto Havasupai lands without the required permit. Commercial passengers and guides make the 8-mile round-trip to Beaver Falls, or hike even farther to the more spectacular falls, but a larger proportion of noncommercial river runners make the hike because they have more time and less rigid schedules than their commercial counterparts. Some people also join or leave noncommercial trips by way of the Havasupai Reservation, although the number is relatively small. In addition to trespass, impacts of hikers on tribal lands may include accumulations of human waste and litter, vandalism, social trailing, and damage to cultural resources.
- Some river recreationists venture onto Hualapai tribal lands without the required tribal permit. Because of the length of river corridor bordered by Hualapai lands (108 miles) and the many campsites, accessible side canyons, and popular stops in that reach, the potential for trespass is high. The remoteness of the area and extreme difficulties of access effectively prevent tribal presence to enforce permit requirements. In addition to trespass, impacts of hikers on tribal lands include accumulations of human waste and litter, vandalism, social trailing, and damage to cultural resources. The Hualapai Indian Reservation is also affected by tribally permitted helicopter passenger exchanges at the Whitmore helipad, levels of use in the Lower Gorge, and use of Diamond Creek road for takeouts and launches. For an analysis of impacts associated with these topics, see the “Socioeconomic,” “Visitor Use and Experience,” “Natural Soundscape,” and “Air Quality” sections of this chapter. The following only concerns the issue of trespass and associated impacts.

GUIDING REGULATIONS AND POLICIES

Guiding regulations and policies specific to adjacent lands reflect the management guidance for Glen Canyon, Lake Mead, and adjacent tribal lands. Management guidance for Glen Canyon is provided by the 1979 Glen Canyon National Recreation Area General Management Plan and the Strategic Plan for Glen Canyon National Recreation Area and Rainbow Bridge National Monument, October 1, 2000–September 30, 2005. The recreation area is also preparing a Colorado River Recreation Report that will provide information to help determine the types and amounts of use that are appropriate on the river. Glen Canyon staff manages most of the Lees Ferry area, but activities associated with downstream river running are the responsibility of the park. Written Standard Operating Procedures and a Memorandum of Understanding govern coordination between the two national park system units.

Use of boat ramps and facilities in Lake Mead by river runners, and upriver travel into Grand Canyon from Lake Mead, require close coordination between Lake Mead and Grand Canyon. In an arrangement similar to the one at Lees Ferry, Lake Mead and Grand Canyon have Standard Operating Procedures and a Memorandum of Understanding in place to facilitate coordination.

The Hualapai Tribe occupies a 992,463-acre reservation south of the Colorado River. According to a Memorandum of Understanding between the Hualapai Tribe, Grand Canyon, and Lake Mead signed in September 2000:

The Hualapai Tribe and the DOI [U.S. Department of the Interior] disagree on the location of the boundary between the Hualapai Indian Reservation and GRCA.... Accordingly, both the Hualapai Tribe and DOI claim jurisdictional authority from about River Mile 164.5 to about River Mile 273.5 from the center of the river to the highwater [sic] mark on river left....To reduce further conflict on this issue, and to work towards a productive relationship, the parties have committed themselves to mutual management of an Area of Cooperation [AOC] to minimize the practical and operational impact of the boundary dispute....The initial AOC as mutually agreed upon by the parties includes the area from the high water mark to high water mark from about River Mile 164.5 to River Mile 277 and that part of Lake Mead from River Mile 277 to Pearce Ferry. (MOU 2000: p. 2)

Management issues pertaining to the AOC are addressed in meetings of a standing federal-tribal Core Team, which includes representatives of the Hualapai Tribe, Grand Canyon National Park, and Lake Mead National Recreation Area. The Core Team meets at least quarterly. Primary committees of the Core Team address issues of law enforcement, permitting, fire management, and revision of the river management plan, among others. Procedural steps for facilitating negotiation and consensus building among the parties are outlined in the Memorandum of Understanding.

Laws, policies, and regulations regarding consultation with American Indian Tribes are discussed in detail in Chapter 5 of this document.

MANAGEMENT OBJECTIVES FOR ADJACENT LANDS

Management objectives for adjacent lands as they relate to management of recreational river use in the Grand Canyon are as follows:

- Minimize adverse effects from river management to areas outside of the park.
- Minimize adverse effects of adjacent land activities on park resources and river activities.
- Work cooperatively with the Hualapai Tribe and other adjacent land managers on alternatives and implementation of the final plan.

METHODOLOGY FOR ANALYZING EFFECTS TO ADJACENT LANDS

The general process for assessing impacts to adjacent lands focuses on the issues previously identified in this chapter. Analysis of environmental consequences identifies the types and degree of effects associated with visitor use management variables on each of the issues and assesses how effects would change with the implementation of each alternative. Analysis focuses on management issues that are not analyzed in the impact analysis for the various resource topics, although impacts to resources that affect adjacent lands are summarized where appropriate.

Analysis of impacts was based on the interaction of context, duration, timing, and intensity of visitor impacts. Intensity of impacts, both regional and local, was defined using specific impact thresholds.

IMPACT THRESHOLDS

The general process for assessing impacts to the environment is discussed in the “Introduction” to Chapter 4. Effects specific to adjacent lands are characterized for each alternative based on the impact thresholds defined below. Additionally, each alternative was evaluated to determine whether effects would be direct or indirect.

Intensity

Negligible — The impact would be barely detectable and/or would affect few neighbors.

Minor — The impact would be slight, but detectable, and/or would affect a minority of neighbors.

Moderate — The impact would be readily apparent and/or would affect many neighbors.

Major — The impact would be severely adverse or exceptionally beneficial and/or would affect the majority of neighbors.

Context

Localized — Impacts would be restricted to specific resources, facilities, locations, or operations

Regional — Impacts would occur to several specific facilities, locations, or operations within a management zone. This could also include impacts to facilities, locations or operations of regional significance.

Duration

Short term — Effects would occur for a period of less than 1 year.

Long term — Effects would occur for the life of the plan (10 years or longer).

Timing

Impacts have varying degrees of effect based on when they occur.

MITIGATION OF EFFECTS

Consultations with American Indian tribes as part of the revision of the *Colorado River Management Plan* identified that visitor impacts to cultural and natural resources are a concern on adjacent lands. Impacts from river related visitor use are unknown, but thought to be similar, albeit greatly reduced from the main canyon environment itself. Reasonable mitigations for impacts to specific impact topics are presented in the Environmental Consequences section of each impact topic.

Reasonable mitigations specifically related to adjacent lands include the following:

- Increase in staffing at access/egress points for adjacent lands
- Increased education about Tribal and Agency boundaries and permitting processes

- Increased efforts to ensure visitors have proper permits outside Grand Canyon National Park
- Scheduling takeouts
- Quiet technology for helicopters

CUMULATIVE IMPACTS

Cumulative impacts on adjacent lands were determined by combining the impacts of each alternative with other past, present, and reasonably foreseeable future actions (see the “Introduction” to Chapter 4 for detailed list of all actions). Specific cumulative impacts are discussed. Grand Canyon National Park, Lake Mead National Recreation Area, and the Hualapai Tribe would continue to derive benefit from cooperative management of the Lower Gorge within the Core Team process. Similarly, Grand Canyon National Park, Glen Canyon National Recreation Area, and Lake Mead National Recreation Area benefit from respective memorandums of understanding that facilitate coordination and management of river facilities. These cooperative efforts result in localized, beneficial, long-term, minor to moderate impacts to Grand Canyon National Park and its adjacent lands.

ASSUMPTIONS

General assumptions used for analysis of effects from each alternative are discussed in the “Introduction” to Chapter 4. Assumptions that specifically relate to the plan alternatives and their effect on adjacent lands are presented below:

- Launch schedules, group sizes, and trip lengths affect the degree of use and crowding at put-ins, exchange points, takeouts, and attraction sites on adjacent lands. The interaction of these variables, and the indicators (trips at one time, user discretionary time) that result from that interaction were used to determine the effects of crowding in Glen Canyon, Lake Mead, and the Hualapai Tribe.
- Impacts on Grand Canyon-Parashant National Monument were assessed by considering the number, types, and schedule of exchanges allowed at the Whitmore exchange.
- The effects of river recreation on adjacent tribal lands result from both authorized and unauthorized visitation. Based on consultations with tribal representatives (see Chapter 5), adverse impacts resulting from this access include disturbance of local residents, erosion of unimproved roads, and disturbance of livestock, accumulations of human waste and litter, vandalism, social trailing, and damage to cultural and natural resources. Tribal permit fees can help to mitigate these impacts, but because of the remoteness of the river corridor and its adjacent lands, tribal permit systems are difficult to implement and enforce. Under current conditions, NPS rangers inform river visitors that they are required to pay trespass fees to the appropriate tribal jurisdictions when visiting tribal lands, but anecdotal evidence suggests that many do not. It is assumed that changes in use patterns in each alternative cannot be adequately correlated with unpermitted access onto tribal lands, given that increased education and enforcement of the permitting process serves to reduce trespass and assure acknowledgment of tribal laws and sovereignty.

Because this is an issue of concern that has been raised by several tribes, it is assumed that an increase in education and enforcement of permit process will be common to all action alternatives.

- Potential conflicts between recreation users and researchers would be similarly mitigated under each alternative through increased education of researchers and the public. Additionally, conflicts over campsites would be reduced as all of the action alternatives reduce spikes in crowding by implementing a launch based system.
- Recreational use of the Colorado River in Grand Canyon National Park would affect management of Glen Canyon Dam only to the extent that the BOR would have to consider potential impacts of dam operations on river running when making decisions. Coordination between recreational river use and dam operations would continue to be achieved through the Glen Canyon Dam Adaptive Management Program. It is anticipated that any potential conflicts between river use and dam operations would be resolved within an existing venue.
- Some river runners may leave or join river trips by way of a number of trails with access/egress on adjacent US Forest Service lands. The amount of river-related use that may occur is unknown but it is anticipated to be very little. For example, the Nankoweap Trail is long, difficult, and requires a lengthy drive over primitive roads to reach the trailhead, making it unattractive as an easy route to meet a river trip. It is assumed that a low level of trespass from river users would occur on the Kaibab National Forest, regardless of the alternative.
- Similarly, river runners (primarily noncommercial) cross BLM land to the north and west of Grand Canyon while leaving or joining river trips. The amount of such use is unknown, but these routes are relatively difficult to access on the rim, and use is thought to be by a very small percentage of river runners.
- Management of recreational river use of the Colorado River directly influences the socioeconomic conditions of the Hualapai Tribe, given that Diamond Creek is a primary takeout, and the Hualapai Tribe manages a variety of operations in the Lower Gorge and Whitmore. An analysis of socioeconomic effects on the Hualapai Tribe is presented in “Impacts on Socioeconomic Conditions.”
- Grand Canyon West (GCW) is a 9,000 acre tour-related facility operating on the Hualapai Reservation under the Grand Canyon Resort Corporation (GCRC), which is wholly owned by the Hualapai Tribe. Development plans for GCW include airport expansion, road and view-point access improvements, construction of cluster lodging, employee housing, camping and RV sites, a rim to river tram, a golf course and a health and wellness center. Current GCRC operations include Hualapai River Runner (HRR) trips, pontoon tours (with helicopter access and egress), helicopter rim-to-river tours, van tours to Diamond Creek and GCW, hotel and ranch accommodations, and excursions to GCW facilities and overlooks. Of these operations, only the HRR and pontoon trips, which access the Colorado River as it passes through Grand Canyon National Park, are included within the scope of the *Colorado River Management Plan*. All other GCRC operations are conducted on sovereign Hualapai Tribal lands and are not under the purview of this plan.

- Due to the topography of the Lower Gorge, it is assumed that a low level of trespass from river users would occur in Lake Mead and on Hualapai tribal land, regardless of the alternative. Increased education and improvements to permitting systems will be addressed in the implementation plan.
- It is assumed that, because Lower Gorge alternatives offer a range of opportunities that are consistent with lake use as addressed in the Lake Mead Lake Management Plan, upriver use would have a negligible effect on the management of Lake Mead, regardless of the alternative.
- Impacts to adjacent lands in the Lower Gorge are addressed in the analysis of Lees Ferry alternatives presented below, in the assumptions stated above, or in resource-specific analysis of the Lower Gorge alternatives as presented in each section of Chapter 4, Environmental Consequences. Because these discussions sufficiently address all identified impacts to adjacent lands specific to Lower Gorge alternatives, a separate analysis of Lower Gorge alternatives is not presented in this Section.

IMPACT ANALYSIS — LEES FERRY ALTERNATIVES

ALTERNATIVE A (CURRENT CONDITIONS)

Analysis

The most noticeable effect to adjacent lands under Alternative A is from overall use and crowding at put-ins, exchange points, takeouts, and attraction sites on adjacent lands. Launches per day is one of the most important factors in assessing and addressing issues of encounters with other groups, congestion at launch and takeout sites and at attraction sites. Put-ins and takeouts have limited space as well as limited staff to manage visitors. Current conditions result in launch delays, visitor conflicts with ramp staff and other visitors, oversights in health and safety procedures, lost revenue for commercial operators who miss scheduled takeouts, and physical impacts to ramps and associated facilities.

Under current conditions, up to nine trips can launch in the summer and up to seven trips can launch in the fall shoulder season from Lees Ferry in a single day. Large groups (up to 43 passengers) compound the problem of congestion created by these spikes in use. Up to six trips take out per day at Diamond Creek, which has the capacity to comfortably accommodate only two takeouts at a time, given that HRR trips are launching from the same beach. Up to 11 trips take out on peak days at the South Cove dock, which reasonably accommodates 5 trip takeouts per day. There is currently no procedure for scheduling takeouts at either Diamond Creek or Lake Mead. Because impacts on adjacent lands from spikes in use are noticeable to staff, operators, and visitors, the effect is moderate, adverse, short term and localized. The effects are limited to the high-use summer season and the month of September, which has more use than the remainder of the shoulder seasons.

Impacts on Grand Canyon-Parashant National Monument (Parashant) depend on the number, type, and schedule of exchanges allowed at the Whitmore exchange. There are currently no limits on helicopter use for passenger exchanges at Whitmore (currently, approximately 6,800 passengers end and 3,500 passengers begin their trips by helicopter). Nearly all of the helicopter

exchanges occur in May, June, July, and August, a small number of exchanges in April, September, and October (see Chapter 3) Whitmore (RM 187) is on Hualapai tribal land (river left) and consists of a boat tie-up area and nearby helicopter landing pad. It is used by commercial trips as an exchange location for passengers to begin/end their river trip with a 6-minute helicopter flight to/from the Bar-10 Ranch. (The Bar-10 Ranch is located 10-miles north of the rim and provides river runners with a pre- and post-trip base for helicopter transport in and out of the Canyon.) Impacts from helicopter exchanges to Parashant are primarily restricted to helicopter noise, which is inconsistent with the wilderness characteristics for which the monument manages. Spikes in helicopter exchanges result in up to 5 river trips exchanging per day, with large trips taking up to 1.5 hours to shuttle all passengers in and out. This use results in a short term, adverse, moderate, localized effect that occurs primarily in the summer months.

Passengers also have the option of hiking up the Whitmore trail (river right) to the rim on a 1.3 mile, 1,200 vertical feet trail. The hike up the Whitmore trail takes the average hiker less than an hour (less than 30-minutes coming down), but the hike is hot during the summer months and road access is limited. This trail offers access to the Bar-10 Ranch via a 9-mile, unimproved road through BLM lands. Access to St. George, Utah from the ranch is via an 80 mile unimproved dirt road that passes through Parashant National Monument. Effects from hiking exchanges are primarily physical impacts to the Whitmore Trail and to the primitive road between St. George and the Bar-10 Ranch. Very few hiking exchanges occur under current conditions, thus this use results in a negligible localized effect.

Overall, Alternative A would result in a short term, adverse, moderate, localized effect that occurs primarily in the summer months. This alternative does not meet the management objective of minimizing adverse effects from river management to areas outside of the park.

Mitigation of Effects

Actions needed to mitigate effects from access onto adjacent lands would include all of those discussed above (increased staffing at access/egress points for adjacent lands, and increased education and enforcement of permitting processes). Scheduling of takeouts would somewhat mitigate the effects of crowding at takeout and launch facilities, but because current management of the river corridor allows substantial spikes in use, as well as the largest group sizes of any of the alternatives, it is unlikely that that mitigations would be implemented at a level sufficient to reduce impacts to a minor intensity. Similarly, while quiet technology for helicopters could mitigate some of the effects to the soundscape at the Whitmore exchange, spikes in use in this alternative make it unlikely that mitigations would be implemented at a level sufficient to reduce impacts to a minor intensity.

Cumulative Effects

Cumulatively, Lake Mead and the Hualapai Tribe would continue to derive the benefit of cooperative management of the Lower Gorge within the Core Team process. Similarly, Glen Canyon and Lake Mead benefit from respective memorandums of understanding that facilitate coordination and management of river facilities. These cooperative efforts result in beneficial, long-term, localized, minor to moderate impacts to Grand Canyon National Park and its adjacent

lands. Cumulatively, the effects of Alternative A, when combined with these past, present, and reasonably foreseeable actions, would result in localized, adverse, long-term, minor to moderate effects to adjacent lands. Alternative A would result in a localized, adverse, long-term, moderate contribution to these cumulative effects.

Conclusion

Effects from Alternative A would be direct and measurable to adjacent lands and would result in short term, adverse moderate effects to localized facilities. This effect would be most pronounced in the high-use summer seasons. Cumulatively, the effects of Alternative A, when combined with these past, present, and reasonably foreseeable actions, would result in localized, adverse, long-term, minor to moderate effects to adjacent lands. Alternative A would result in a localized, adverse, long-term, moderate contribution to these cumulative effects.

ALTERNATIVE B

Analysis

Under Alternative B, recreational motor trips and passenger exchanges at Whitmore are prohibited. Group sizes, maximum daily launches, and probable total yearly passengers are the lowest of any of the alternatives (see Table 4-1). Implementation of a launch-based system eliminates spikes in use.

The most noticeable effect to adjacent lands under Alternative B is from the reduction in overall use and crowding at put-ins, exchange points, takeouts, and attraction sites on adjacent lands. Under this alternative, launches per day are reduced from nine (current) to four in the summer and from seven (current) to two in the shoulder seasons. Reduction in group sizes from up to 43 passengers (current) to 25 similarly alleviates congestion. These factors, along with the implementation of scheduling of takeouts at Diamond Creek and Lake Mead, would effectively reduce congestion at river facilities associated with the *Colorado River Management Plan* on adjacent lands. Consequently, effects to these facilities would be localized, direct, short to long term, beneficial and minor to moderate. This effect would be most pronounced in the high-use summer season.

Because no exchanges, hiking or helicopter, are allowed in this alternative, impacts on Parashant would be localized, direct, short to long term, beneficial and minor to moderate. This effect would be most pronounced from current condition in the high-use summer season.

Overall, Alternative B would result in localized, direct, short to long term, beneficial and minor to moderate effect. This effect would be most pronounced from current condition in the high-use summer season. This alternative exceeds the management objective of minimizing adverse effects from river management to areas outside of the park.

Mitigation of Effects

Given that implementation of education and enforcement of permit systems is common to all action alternatives, no mitigation would be required for impacts to adjacent lands in Alternative B, which are not anticipated to reach moderate adverse impact thresholds.

Cumulative Effects

Cumulatively, Lake Mead and the Hualapai Tribe would continue to derive the benefit of cooperative management of the Lower Gorge within the Core Team process. Similarly, Glen Canyon and Lake Mead benefit from respective memorandums of understanding that facilitate coordination and management of river facilities. These cooperative efforts result in a localized, beneficial, long-term, minor to moderate impact to Grand Canyon National Park and its adjacent lands. Cumulatively, the effects of Alternative B, when combined with these past, present, and reasonably foreseeable actions, would result in localized, beneficial, long-term, moderate effects to adjacent lands. Alternative B would result in a localized, beneficial, long-term, moderate contribution to these cumulative effects.

Conclusion

Compared to current condition, Alternative B would result in localized, direct, short to long term, beneficial and minor to moderate effects. This effect would be most pronounced from in the high-use summer season. Cumulatively, the effects of Alternative B, when combined with other past, present, and reasonably foreseeable actions, would result in localized, beneficial, long-term, moderate effects to adjacent lands. Alternative B would result in a localized, beneficial, long-term, moderate contribution to these cumulative effects.

ALTERNATIVE C

Analysis

Under Alternative C, recreational motor trips and helicopter exchanges at Whitmore are prohibited, although hiking exchanges are permitted all year long. Group sizes and trip lengths are at lower levels than current, but probable total user-days and user discretionary time are the highest of any of the alternatives (see Table 4-1). Probable yearly passengers increase from 22,461 (current) to 25,228. Implementation of a launch-based system eliminates spikes in use.

The most noticeable effect to adjacent lands under Alternative C is from the reduction in overall use and crowding at put-ins, exchange points, takeouts, and attraction sites on adjacent lands. Under this alternative, launches per day are reduced from nine (current) to four in the summer and from seven (current) to three in the shoulder seasons. Winter launches increase to 2 per day, but this level is considered negligible in regards to contributing to congestion at launch and takeout facilities. Reduction in group sizes from up to 43 passengers (current) to 30 similarly alleviates congestion. These factors, along with the implementation of scheduling of takeouts at Diamond Creek and Lake Mead, would effectively reduce congestion at river facilities

associated with the *Colorado River Management Plan* on adjacent lands. Consequently, effects to these facilities would be localized, direct, short to long term, beneficial and minor to moderate. This effect would be most pronounced in the high-use summer season.

Because no helicopter exchanges are allowed in this alternative, noise impacts on Parashant would be localized, direct, short to long term, beneficial and minor to moderate.

Hiking exchanges would increase from current, but would be limited to 2,500 passengers hiking in and 2,500 passengers hiking out per year. Given that this number of exchanges did occur, it impacts to the Whitmore trail would probably be noticeable. Additionally, increased traffic on the access road would affect the primitive nature of the road and the surrounding landscape. Unauthorized camping in the vicinity of the trailhead would also likely increase. Effects to adjacent lands from this level of Whitmore hiking exchanges would be direct, localized, long term, adverse and negligible to minor. It is assumed that most hiking exchange would occur in the cooler, off-season months.

Overall, Alternative C would result in localized, direct, short to long term, beneficial, and minor to moderate effects. This effect would be year-round, but would be most pronounced from current condition in the high-use summer season. This alternative exceeds the management objective of minimizing adverse effects from river management to areas outside of the park.

Mitigation of Effects

Assuming that implementation of education and enforcement of permit systems is common to all action alternatives, no mitigation would be required for impacts to adjacent lands in Alternative C, which are not anticipated to reach moderate adverse thresholds for impacts.

Cumulative Effects

Cumulatively, Lake Mead and the Hualapai Tribe would continue to derive the benefit of cooperative management of the Lower Gorge within the Core Team process. Similarly, Glen Canyon and Lake Mead benefit from respective memorandums of understanding that facilitate coordination and management of river facilities. These cooperative efforts result in a localized, beneficial, long-term, minor to moderate impact to Grand Canyon National Park and its adjacent lands. Cumulatively, the effects of Alternative C, when combined with these past, present, and reasonably foreseeable actions, would result in localized, beneficial, long-term, moderate effects to adjacent lands. Alternative C would result in a localized, beneficial, long-term, moderate contribution to these cumulative effects.

Conclusion

Overall, Alternative C would result in localized, direct, short to long term, beneficial, and minor to moderate effects. This effect would be year-round, but would be most pronounced from current condition in the high-use summer season. Cumulatively, the effects of Alternative C, when combined with these past, present, and reasonably foreseeable actions, would result in

localized, beneficial, long-term, moderate effects to adjacent lands. Alternative C would result in a localized, beneficial, long-term, moderate contribution to these cumulative effects.

ALTERNATIVE D

Analysis

Under Alternative D, helicopter exchanges at Whitmore are prohibited, although hiking exchanges are permitted all year long. Group sizes and trip lengths are at lower levels than current, but probable total user-days and user discretionary time are among the highest of any of the alternatives (see Table 4-1). Probable yearly passengers decrease from 22,461 (current) to 20,427 and probable total user-days increases from 171,131 (current) to 223,314. Implementation of a launch-based system eliminates spikes in use.

The most noticeable effect to adjacent lands under Alternative D is from the reduction in overall use and crowding at put-ins, exchange points, takeouts, and attraction sites on adjacent lands. Under this alternative, launches per day are reduced from nine (current) to five in the summer and from seven (current) to three in the shoulder seasons. Reduction in group sizes from up to 43 passengers (current) to 25 similarly alleviates congestion. These factors, along with the implementation of scheduling of takeouts at Diamond Creek and Lake Mead, would effectively reduce congestion at river facilities associated with the *Colorado River Management Plan* on adjacent lands. Consequently, effects to these facilities would be localized, direct, short to long term, beneficial and minor to moderate. This effect would be most pronounced in the high-use summer season.

Because no helicopter exchanges are allowed in this alternative, noise impacts on Parashant would be localized, direct, short to long term, beneficial and minor to moderate. However, hiking exchanges would increase from current, but would be limited to 2,500 passengers hiking in and 2,500 passengers hiking out per year. If this number of exchanges did occur, impacts to the Whitmore trail would probably be noticeable. Additionally, increased traffic on the access road would affect the primitive nature of the road and the surrounding landscape. Unauthorized camping in the vicinity of the trailhead would also likely increase. Effects to adjacent lands from this level of Whitmore hiking exchanges would be direct, localized, long term, adverse and negligible to minor. It is assumed that most hiking exchange would occur in the cooler, off-season months.

Overall, Alternative D would result in localized, beneficial, short- to long-term, and minor to moderate effects, as well as adverse, minor effects. Effects would be year-round, but would be most pronounced from current conditions in the high-use summer season. This alternative would exceed the management objective of minimizing adverse effects from river management to areas outside the park.

Mitigation of Effects

Assuming that implementation of education and enforcement of permit systems is common to all action alternatives, no mitigation would be required for impacts to adjacent lands in Alternative D, which are not anticipated to reach moderate adverse thresholds for impacts.

Cumulative Effects

Cumulatively, Lake Mead and the Hualapai Tribe would continue to derive the benefit of cooperative management of the Lower Gorge within the Core Team process. Similarly, Glen Canyon and Lake Mead benefit from respective memorandums of understanding that facilitate coordination and management of river facilities. These cooperative efforts result in a localized, beneficial, long-term, minor to moderate impact to Grand Canyon National Park and its adjacent lands. Cumulatively, the effects of Alternative D, when combined with these past, present, and reasonably foreseeable actions, would result in localized, beneficial, long-term, moderate effects to adjacent lands. Alternative D would result in a localized, beneficial, long-term, minor to moderate contribution to these cumulative effects.

Conclusion

Overall, Alternative D would result in localized, beneficial, short- to long-term, minor to moderate effects, as well as adverse, minor effects. This effect would be year-round, but would be most pronounced from current condition in the high-use summer season. Cumulatively, the effects of Alternative D, when combined with past, present, and reasonably foreseeable actions, would result in localized, beneficial, long-term, moderate effects to adjacent lands. Alternative D would result in a localized, beneficial, long-term, minor to moderate contribution to these cumulative effects.

ALTERNATIVE E***Analysis***

Under Alternative E, helicopter exchanges at Whitmore are allowed during the 6 month motor season although hiking exchanges are permitted all year long. Group sizes and trip lengths are at lower levels than current, but user discretionary time is among the highest (see Table 4-1). Probable yearly passengers increase from 22,461 (current) to 23,812 and probable total user-days increases from 171,131 (current) to 237,183. Implementation of a launch-based system eliminates spikes in use.

The most noticeable effect to adjacent lands under Alternative E is from the reduction in overall use and crowding at put-ins, exchange points, takeouts, and attraction sites on adjacent lands. Under this alternative, launches per day are reduced from nine (current) to six in the summer and from seven (current) to three in the shoulder seasons. Winter launches increase to 2 per day, but this level is considered negligible in regards to contributing to congestion at launch and takeout facilities. Reduction in group sizes from up to 43 passengers (current) to 30 similarly alleviates

congestion. These factors, along with the implementation of scheduling of takeouts at Diamond Creek and Lake Mead, would effectively reduce congestion at river facilities associated with the *Colorado River Management Plan* on adjacent lands. Consequently, effects to these facilities would be localized, direct, short to long term, beneficial and minor. This effect would be most pronounced in the high-use summer season.

Helicopter exchanges are allowed in this alternative, but would be restricted to the six month no-motor season and would be limited to 2,500 passengers in and 2,500 out. This represents a substantial decrease from the approximately 6,800 passengers that end and 3,500 passengers that begin their trips by helicopter under current condition. Additionally, the launch schedule would eliminate spikes in use that result in days with longer periods of noise impacts from helicopter shuttles. The impacts on Parashant would be localized, direct, short to long term, beneficial and minor.

Hiking exchanges would be allowed year-round, but it is unclear how many passengers would choose to take this trip compared to current condition. Increases in hiking exchanges would result in impacts to the Whitmore trail. Additionally, increased traffic on the access road would affect the primitive nature of the road and the surrounding landscape. Unauthorized camping in the vicinity of the trailhead would also likely increase. Effects to adjacent lands from this level of Whitmore hiking exchanges would be direct, localized, long term, adverse and negligible to minor. It is assumed that most hiking exchange would occur in the cooler, off-season months.

Overall, Alternative E would result in localized, beneficial, short- to long-term, minor effects, as well as adverse, minor effects. These effects would be year-round, but would be most pronounced from current condition in the high-use summer season. This alternative would meet the management objective of minimizing adverse effects from river management to areas outside of the park.

Mitigation of Effects

Assuming that implementation of education and enforcement of permit systems is common to all action alternatives, no mitigation would be required for impacts to adjacent lands in Alternative E, which are not anticipated to reach moderate adverse thresholds for impacts.

Cumulative Effects

Cumulatively, Lake Mead and the Hualapai Tribe would continue to derive the benefit of cooperative management of the Lower Gorge within the Core Team process. Similarly, Glen Canyon and Lake Mead benefit from respective memorandums of understanding that facilitate coordination and management of river facilities. These cooperative efforts result in a localized, beneficial, long-term, minor to moderate impact to Grand Canyon National Park and its adjacent lands. Cumulatively, the effects of Alternative E, when combined with these past, present, and reasonably foreseeable actions, would result in localized, beneficial, long-term, moderate effects to adjacent lands. Alternative E would result in a localized, beneficial, long-term, minor to moderate contribution to these cumulative effects.

Conclusion

Overall, Alternative E would result in localized, beneficial and adverse, short- to long-term, minor effects, particularly over current conditions. These effects would be year-round, but would be most pronounced from current condition in the high-use summer season. Cumulatively, the effects of Alternative E, when combined with these past, present, and reasonably foreseeable actions, would result in localized, beneficial, long-term, moderate effects to adjacent lands. Alternative E would result in a localized, beneficial, long-term, minor to moderate contribution to these cumulative effects.

Alternative F

Analysis

Under Alternative F, helicopter exchanges at Whitmore are allowed during the 6 month motor season (January through June) although hiking exchanges are permitted all year long. Group sizes and trip lengths are at lower levels than current condition. User discretionary time is higher than current condition, but relatively low as compared to several other alternatives (see Table 4-1). Probable yearly passengers increase from 22,461 (current) to 25,415 and probable total user-days increases from 171,131 (current) to 235,146. Implementation of a launch-based system eliminates spikes in use.

The most noticeable effect to adjacent lands under Alternative F is from the reduction in overall use and crowding at put-ins, exchange points, takeouts, and attraction sites on adjacent lands. Under this alternative, launches per day are reduced from nine (current) to six in the summer and from seven (current) to four in the shoulder seasons. Winter launches increase to 2 per day, but this level is considered negligible in regards to contributing to congestion at launch and takeout facilities. Reduction in group sizes from up to 43 passengers (current) to 30 similarly alleviates congestion. These factors, along with the implementation of scheduling of takeouts at Diamond Creek and Lake Mead, would reduce congestion at river facilities associated with the *Colorado River Management Plan* on adjacent lands. Consequently, effects to these facilities would be localized, direct, short to long term, beneficial and negligible to minor. This effect would be most evident in the high-use summer season.

Helicopter exchanges are allowed in this alternative, but would be restricted to the six month no-motor season and would be limited to a total of 3,400 passengers in and 6,600 passengers out, although hiking would be allowed year-round. This represents a negligible decrease from the approximately 6,800 passengers that end and 3,500 passengers that begin their trips by helicopter under current condition. However, the launch schedule would eliminate spikes in use that result in days with longer periods of noise impacts from helicopter shuttles. The impacts on Parashant would be localized, direct, short to long term, beneficial and negligible to minor.

Hiking exchanges would be allowed year-round, but it is unclear how many passengers would choose to take this trip compared to current condition. Increases in hiking exchanges would result in impacts to the Whitmore trail. Additionally, increased traffic on the access road would affect the primitive nature of the road and the surrounding landscape. Unauthorized camping in the vicinity of the trailhead would also likely increase. Effects to adjacent lands from this level of

Whitmore hiking exchanges would be direct, localized, long term, adverse and negligible to minor. It is assumed that most hiking exchange would occur in the cooler, off-season months.

Overall, Alternative F would result in localized, beneficial and adverse, long-term, negligible to minor effects. These effects would be year-round, but would be most pronounced from current condition in the high-use summer season. This alternative meets the management objective of minimizing adverse effects from river management to areas outside of the park.

Mitigation of Effects

Actions needed to mitigate effects from access onto adjacent lands would include all of those discussed above (increased staffing at access/egress points for adjacent lands, and increased education and enforcement of permitting processes). Scheduling of takeouts would mitigate the effects of crowding at takeout and launch facilities and quiet technology for helicopters and of exchanges could mitigate some of the effects to the soundscape at the Whitmore exchange. A monitoring program would need to be implemented to gather baseline data on impacts from noise and congestion. Levels of needed mitigation would be determined based on the results of the monitoring program.

Cumulative Effects

Cumulatively, Lake Mead and the Hualapai Tribe would continue to derive the benefit of cooperative management of the Lower Gorge within the Core Team process. Similarly, Glen Canyon and Lake Mead benefit from respective memorandums of understanding that facilitate coordination and management of river facilities. These cooperative efforts result in a localized, beneficial, long-term, minor to moderate impact to Grand Canyon National Park and its adjacent lands. Cumulatively, the effects of Alternative F, when combined with these past, present, and reasonably foreseeable actions, would result in localized, beneficial and adverse, long-term, moderate effects to adjacent lands. Alternative F would result in a localized, beneficial and adverse, long-term, minor contribution to these cumulative effects.

Conclusion

Compared to current condition, Alternative F would result in localized, beneficial and adverse, long-term, negligible to minor effects. However, use levels for variables that contribute to congestion at launch and takeout facilities, and that contribute to effects from helicopter exchanges ultimately result in a short term, adverse, minor to moderate, localized effect that occurs primarily in the summer months. Cumulatively, the effects of Alternative F, when combined with past, present, and reasonably foreseeable actions, would result in localized, beneficial and adverse, long-term, moderate effects to adjacent lands. Alternative F would result in a localized, beneficial and adverse, long-term, minor contribution to these cumulative effects.

ALTERNATIVE G

Analysis

Under Alternative G, helicopter exchanges at Whitmore are allowed during the 8 month motor season (January through August) although hiking exchanges are permitted all year long. Group sizes are somewhat lower than current, but are higher than any of the other alternatives. Trip lengths are generally at the lowest levels of all of the alternatives, with the exception of noncommercial winter oar trips, which are still reduced to 21 from 30 (current condition). Yearly user discretionary time is higher than current condition, but is at the lowest levels of all the other alternatives (see Table 4-1). Probable yearly passengers increase from 22,461 (current) to 28,680 and probable total user-days increases from 171,131 (current) to 249,910. Implementation of a launch-based system eliminates spikes in use.

The most noticeable effect to adjacent lands under Alternative G is from the reduction in overall use and crowding at put-ins, exchange points, takeouts, and attraction sites on adjacent lands. Under this alternative, launches per day are reduced from nine (current) to six in the summer and from seven (current) to five in the shoulder seasons. Winter launches increase to 2 per day, but this level is considered negligible in regards to contributing to congestion at launch and takeout facilities. Reduction in group sizes from up to 43 passengers (current) to 40 somewhat contributes to the alleviation of congestion. These factors, along with the implementation of scheduling of takeouts at Diamond Creek and Lake Mead, would reduce congestion at river facilities associated with the *Colorado River Management Plan* on adjacent lands. Consequently, effects to these facilities would be localized, direct, short to long term, beneficial and negligible to minor. This effect would be most evident in the high-use summer season.

Helicopter exchanges are allowed in this alternative, and could occur throughout the eight month no-motor season and would be limited to a total of 3,700 passengers in and 7,200 passengers out, although hiking would be allowed year-round. This represents an increase from the approximately 6,800 passengers that end and 3,500 passengers that begin their trips by helicopter under current condition. The launch schedule would eliminate spikes in use that result in days with longer periods of noise impacts from helicopter shuttles, but large trips would still require several shuttles to complete access and egress. The impacts on Parashant would be localized, short to long term and negligible.

Hiking exchanges would be allowed year-round, but it is unclear how many passengers would choose to take this trip compared to current condition. Increases in hiking exchanges would result in impacts to the Whitmore trail. Additionally, increased traffic on the access road would affect the primitive nature of the road and the surrounding landscape. Unauthorized camping in the vicinity of the trailhead would also likely increase. Effects to adjacent lands from this level of Whitmore hiking exchanges would be direct, localized, long term, and negligible. It is assumed that most hiking exchange would occur in the cooler, off-season months.

Overall, Alternative G would result in localized, short- to long-term, negligible effects. These effects would be year-round, but would be most evident from current condition in the high-use summer season. This alternative meets the management objective of minimizing adverse effects from river management to areas outside of the park.

Mitigation of Effects

Actions needed to mitigate effects from access onto adjacent lands would include all of those discussed above (increased staffing at access/egress points for adjacent lands, and increased education and enforcement of permitting processes). Scheduling of takeouts would mitigate the effects of crowding at takeout and launch facilities and quiet technology for helicopters and of exchanges could mitigate some of the effects to the soundscape at the Whitmore exchange. A monitoring program would need to be implemented to gather baseline data on impacts from noise and congestion. Levels of needed mitigation would be determined based on the results of the monitoring program.

Cumulative Effects

Cumulatively, Lake Mead and the Hualapai Tribe would continue to derive the benefit of cooperative management of the Lower Gorge within the Core Team process. Similarly, Glen Canyon and Lake Mead benefit from respective memorandums of understanding that facilitate coordination and management of river facilities. These cooperative efforts result in a localized, beneficial, long-term, minor to moderate impact to Grand Canyon National Park and its adjacent lands. Cumulatively, the effects of Alternative G, when combined with these past, present, and reasonably foreseeable actions, would result in localized, beneficial and adverse, long-term, moderate effects to adjacent lands. Alternative G would result in a localized, beneficial and adverse, long-term, minor contribution to these cumulative effects.

Conclusion

Compared to current condition, Alternative G would result in localized, beneficial, short- to long-term, negligible effects. However, use levels for variables that contribute to congestion at launch and takeout facilities, and that contribute to effects from helicopter exchanges, would ultimately result in a localized, adverse, short-term, minor to moderate effect primarily in the summer months. Cumulatively, the effects of Alternative G, when combined with past, present, and reasonably foreseeable actions, would result in localized, beneficial and adverse, long-term, moderate effects to adjacent lands. Alternative G would result in a localized, beneficial and adverse, long-term, minor contribution to these cumulative effects.

ALTERNATIVE H (NPS PREFERRED ALTERNATIVE)

Analysis

Under Alternative H, recreational motor trips are permitted March through August, but helicopter exchanges are allowed only during the 4 month peak season. Group sizes are lower than current in the summer and considerably lower in the shoulder season. Trip lengths are lower than current condition, with some opportunities for longer trips in the winter season. Yearly user discretionary time is higher than current condition, but is at the lower than several other alternatives (see Table 4-1). Probable yearly passengers increase from 22,461 (current) to 26,317

and probable total user-days increases from 171,131 (current) to 218,225. Implementation of a launch-based system eliminates spikes in use.

The most noticeable effect to adjacent lands under Alternative H is from the reduction in overall use and crowding at put-ins, exchange points, takeouts, and attraction sites on adjacent lands. Under this alternative, launches per day are reduced from nine (current) to six in the summer and from seven (current) to Three in the shoulder seasons. Reduction in group sizes from up to 43 passengers (current) to 32 in the summer and 24 in the non-summer months contributes to the alleviation of congestion. These factors, along with the implementation of scheduling of takeouts at Diamond Creek and Lake Mead, would reduce congestion at river facilities associated with the *Colorado River Management Plan* on adjacent lands. Consequently, effects to these facilities would be localized, direct, short to long term, beneficial and negligible to minor. This effect would be most evident in the high-use summer season.

Helicopter exchanges are allowed in this alternative, and could occur in the four month summer peak season and would be limited to a total of 5,000 passengers in and 5,000 passengers out (provided they are 1:1 exchanges). This represents a redistribution (and small increase) of exchanges from the approximately 6,800 passengers that end and 3,500 passengers that begin their trips by helicopter under current condition. The launch schedule would eliminate spikes in use that result in days with longer periods of noise impacts from helicopter shuttles. The impacts on Parashant would be localized, beneficial, short to long term and minor.

Hiking exchanges would be allowed during the shoulder season months of March, April, September and October. A total of 2,500 passengers would be allowed to hike in and 2,500 passengers would be allowed to hike out, but it is unclear how many passengers would choose to take this trip compared to current condition. Increases in hiking exchanges would result in impacts to the Whitmore trail. Additionally, increased traffic on the access road would affect the primitive nature of the road and the surrounding landscape. Unauthorized camping in the vicinity of the trailhead would also likely increase. Effects to adjacent lands from this level of Whitmore hiking exchanges would be direct, localized, long term, and negligible. It is assumed that most hiking exchange would occur in the cooler, shoulder season months.

Overall, Alternative H would result in beneficial localized, direct, short to long term, negligible to minor effects. These effects would be year-round, but would be most evident from current condition in the high-use summer season. This alternative meets the management objective of minimizing adverse effects from river management to areas outside of the park.

Mitigation of Effects

Actions needed to mitigate effects from access onto adjacent lands would include all of those discussed above (increased staffing at access/egress points for adjacent lands, and increased education and enforcement of permitting processes). Scheduling of takeouts would mitigate the effects of crowding at takeout and launch facilities and quiet technology for helicopters and of exchanges could mitigate some of the effects to the soundscape at the Whitmore exchange. A monitoring program would need to be implemented to gather baseline data on impacts from

noise and congestion. Levels of needed mitigation would be determined based on the results of the monitoring program.

Cumulative Effects

Cumulatively, Lake Mead and the Hualapai Tribe would continue to derive the benefit of cooperative management of the Lower Gorge within the Core Team process. Similarly, Glen Canyon and Lake Mead benefit from respective memorandums of understanding that facilitate coordination and management of river facilities. These cooperative efforts result in a localized, beneficial, long-term, minor to moderate impact to Grand Canyon National Park and its adjacent lands. Cumulatively, the effects of Alternative H, when combined with these past, present, and reasonably foreseeable actions, would result in localized, beneficial, long-term, moderate effects to adjacent lands. Alternative H would result in a localized, beneficial, long-term, minor to moderate contribution to these cumulative effects.

Conclusion

Compared to current condition, Alternative H would result in beneficial localized, direct, short to long term, negligible to minor effects. However, use levels for variables that contribute to congestion at launch and takeout facilities, and that contribute to effects from helicopter exchanges ultimately result in a short term, adverse, minor to moderate, localized effect that occurs primarily in the summer months. Cumulatively, the effects of Alternative H, when combined with past, present, and reasonably foreseeable actions, would result in localized, beneficial, long-term, moderate effects to adjacent lands. Alternative H would result in a localized, beneficial, long-term, minor to moderate contribution to these cumulative effects.

SUSTAINABILITY AND LONG-TERM MANAGEMENT

UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts are environmental consequences that cannot be avoided, whether it be by implementing mitigation measures or by changing the nature of a proposed action. Thus, unavoidable adverse impacts would persist throughout the duration of the action.

Unavoidable adverse impacts are listed in Table 4-37:

TABLE 4-37: UNAVOIDABLE ADVERSE IMPACTS

Impact Topic	Unavoidable Adverse Impact	Alternatives
Visitor Use and Experience, Natural and Cultural Resources	Congestion from spikes in use	A
Visitor Use and Experience	Disruption of experience for those adversely affected motorboat noise during primary season	A, D, E, G, H
	Elimination of opportunity to take a motorized trip in the Lees Ferry to Diamond Creek portion of the Grand Canyon	B, C
	Elimination of opportunity to take a pontoon tour in the Lower Gorge	2
Soundscape	Noise from Whitmore helicopters	A, E, F, G, H
	Noise from boat motors (Lees Ferry Alternatives)	A, D, E, F, G, H
	Noise from Lower Gorge helicopters	1, 2, 3, 4, 5
	Noise from Lower Gorge pontoons	1, 3, 4, 5,
	Noise from HRR boats	1, 2, 3, 4, 5
	Noise from jetboats	1, 2, 3, 4
Socioeconomic Environment	Loss of revenue to Bar 10 Ranch from Helicopter Exchanges	B, C, D, E
Cultural Resources	Inadvertent and intentional damage (artifact displacement, sediment compaction, etc.) from visitation to localized resources	All
Cave and Paleontological Resources	Inadvertent and intentional damage (artifact displacement, disturbance to bats, etc.) from visitation to localized resources	All
Biological Resources (Flora and Fauna)	Inadvertent and intentional damage (direct destruction of individual plants and animals, disruption of life cycles, impacts to habitat, etc.) to localized resources from visitation	All
Air Quality	Carbon monoxide emissions	A, D, E, F, G, 1, 2, 3, 4, 5
Soils	Sediment depletion from visitation at camp, lunch and attraction sites	All
Water Quality/ Aquatic Resources	Fossil fuel pollution from boat motors	A, D, E, F, G, H, 1, 2, 3, 4, 5,
	Pollution (human waste, lotions, etc.) and turbidity from visitation	All

RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

This section describes the effects of short-term recreational use of the Colorado River Corridor within the Grand Canyon National Park and whether this immediate use is 1) likely to adversely

affect the regional productivity of resources in the Park; and 2) sustainable without significant degradation of the environment. Recreational use includes motor and oar-powered transport, as well as hiking, visitation to attraction sites, camping, swimming, fishing, and helicopter access and egress. Individually, these activities are of short duration, but have the potential to affect the long-term physical condition and productivity because of continual recurrence during the 10-year expected life of the *Colorado River Management Plan*.

Because they are non-renewable resources, cultural, paleontological and cave resources are highly sensitive to even low levels of disturbance and disturbance or destruction of these resources is generally permanent. For example, even short-term visitation of cultural sites along the river corridor may cause long-term incidental degradation of slopes, structures, and artifacts. With implementation of mitigation measures identified in the action alternatives the adverse effects to long-term productivity are minimized

With the exception of alternative A, short-term uses of resources under all of the Lees Ferry action alternatives, with implementation of mitigation measures, would not affect the long-term productivity of the environment for the Park and its natural resources. The continuation of current use patterns in Alternative A includes significant spikes in use which result in crowding and congestion. Additionally, Alternative A does not include any additional management actions (such as reductions in group size or trip lengths) to minimize adverse impacts. Consequently, the negative effects of concentrated use on visitor experience and natural resources represent a trade-off that is unsustainable and results in lowered long-term productivity, particularly to natural resources.

Aside from the following exceptions, short term uses proposed in the Lower Gorge alternatives would not adversely affect regional long term productivity of adjacent lands, air quality, aquatic resources, soil resources, threatened and endangered species, terrestrial wildlife, vegetation, water quality, soundscape and visitor experience:

- Extremely large group sizes for HRR trips in Alternative 1 adversely affect localized resources. Concentrated impacts such as trampling of vegetation and cultural resources, accumulation of human waste, sediment depletion, and disruption of species' life cycles threaten the long-term productivity of these stopping points and the resources that located therein.
- The degree of impacts to visitor experience and natural resources from pontoon use in Alternative 5 indicates that the proposed level of use is unsustainable and compromises the long-term productivity of Park resources.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

This section describes irreversible and irretrievable commitments of resources through the recreational use of the Colorado River Corridor in the Grand Canyon National Park. An irreversible commitment of resources occurs if the commitment cannot be changed once made throughout the lifespan of the plan. Irretrievably committed resources are used, consumed, destroyed, or degraded during implementation of the plan and could not be reused or recovered during the lifespan of the plan.

With implementation of mitigation, none of the alternatives would represent an irretrievable or irreversible commitment of the following resources:

- Socioeconomic
- Water quality
- Soundscape
- Air quality
- Terrestrial Wildlife
- Aquatic Resources

However, because of their sensitivity to low levels of impacts and their non- or negligibly-renewable nature, some resources would be irretrievably or irreversibly committed. This commitment is discussed in Table 4-38.

TABLE 4-38: IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES.

Resource	Type of Commitment/Reason for Commitment	Alternatives	Irretrievable	Irreversible
Cultural, Cave, and Paleontological Resources	Degradation of resource value and integrity from visitation (artifact displacement, vandalism, trampling of cultural resource)	All (lower levels in Alternatives in B, E, F, G, H, 2, 3, 4, and 5)	Permanent	Permanent
Biological Soil Crusts	Trampling of crusts in the OHWZ from excursions into OHWZ	All (lower levels in Alternatives B, D, E, F, H, 2, 3, 4,)	Plan lifespan	Plan lifespan
Sediments in visitor use areas	Sediment depletion and compaction from camping, hiking, boat mooring and wakes, and access/egress to the river	All (lower levels in Alternatives B and 2)	Plan lifespan	Plan lifespan
Dominant Vegetation in the Old High Water Zone	Modification, Destruction, and replacement by exotic species from excursions into OHWZ	All (lower levels in Alternatives B, D, E, F, H, 2, 3, 4,)	Plan lifespan	Plan lifespan